Potential of *Amaranthus* in improving urban farmers' livelihoods in Kampala

by

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Declaration

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Summary

During the last couple of decades, the importance of urban agriculture has increased. There is, however, substantial knowledge gap on agriculture as practised in urban spaces. This study investigates the potentials of *amaranthus* to improve urban livelihood in Kampala. *Amaranthus* is an under-valued crop, faces low participation, and the urban farmers do not fully exploit its potential opportunities in Kampala, and yet the awareness of the health benefits has contributed to the increase in the consumption in Kampala.

Previous studies on Uganda have focused on promoting grain *amaranthus* production as a way to improve food security, nutrition and household income. Few other studies gave an insight on cultivation in urban areas, particularly in utilising small spaces. The literature is, however, still sparse and mostly focussed on production in general and did not focus on urban agriculture specifically. The study was conducted in Kampala across four divisions among 120 urban growing households and 82 *amaranthus* growing households. Four key informant interviews were also obtained from the institutional structures involved/governing urban farming in Kampala. Sustainable Livelihoods Approach (SLA) were used to assess the potential of growing *amaranthus* in enhancing household livelihoods.

Contrary to other findings on urban farming, it was observed in this study that more male farmers are engaging in *amaranthus* growing than female, this could be a new trend. Similarly, more male-headed households are seen participating compared to female-headed households. It was also observed that female farmers took up growing *amaranthus* for own consumption while male farmers were mainly doing it for income. *Amaranthus* had the least opportunity cost compared to other crops thus a more competitive crop compared to other crops. The study concluded that *amaranthus* has the potential to enhance household livelihoods since household can obtain their desired outcome like more food supply, income and health benefits from the production of this crop. However, this could be improved through more favourable ordinances and policies towards urban farming. Various potentials were observed in this study, i.e. economic potentials, income-generating potentials, employment potentials and social impacts. Therefore, accept the hypothesis that growing *amaranthus* could enhance urban farmers household livelihood.

Dedication

This thesis is dedicated to

my late father, Dr Okumu Luka Jovita.

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I want to thank God for all the grace, guidance and protection. I want to thank my supervisor, Dr Greyling Jan, for the direction throughout the study. I also would like to thank my father, the late Dr Okumu Luka Jovita, who inspired and encouraged me to always thrive for success in every aspect of life. I would also like to extend my gratitude to my maternal uncle, aunt Awori Catherine Abbey and mother Awino Betty Okumu for the financial support, encouragement and support throughout this study.

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1 Introduction

At present, it is estimated that 25-30 percent of the world's urban dwellers are involved in urban agriculture. This practise is particularly widespread in the urban areas of several African countries such as Kenya, Zimbabwe, Tanzania, Cameroon, Ghana, China, South Africa, Zambia and Uganda (see Austin & Visser, 2002; Holmer & Laquinta, 2006; Maxwell, 1995; Prain *et al.*, 2010; van Veenhuizen, 2006; Orsini *et al.*, 2013). The increase in the prevalence of urban agriculture has been attributed to these economic crises of the 1980s that resulted in a decline in formal employment and reduced the quality of urban services. In response, many urban dwellers took up urban agriculture to supplement their food and income (Binns and Lynch, 1998).

In Uganda, Maxwell (1995) observed that urban agriculture has been on the rise since the 1970s and that by 1993 the highest participation was among women who used it as a household strategy to overcome food insecurity and also income supplementation. The author also observed that the gender roles of women like household duties, childcare, together with the cultural expectations from women to provide food for the family played a fundamental role in giving rise to the importance of urban agriculture in Uganda. These contributing factors are also confirmed by various studies and statistics for example; in the early 2000s, women have been shown to contribute 80 percent to the food produce (Kiguli. N & Kiguli, 2004); a study done by the FAO (2007) which showed that about 3.6 million women are engaged in subsistence farming in Uganda. Currently, women still have a substantial role in the statistics of Uganda making about 21 percent of the female working population in urban areas UBOS (2018).

Authors like Ecker, Weinberger and Qaim (2010) observed that most households in Uganda are still food insecure with higher dependence on staple foods and a low intake of fruits and vegetables. This has created nutritional and calorie deficiencies. Uganda was ranked as the top three best countries in food quality and safety in Sub-Sahara Africa, and the best country in diet availability of vegetal iron (Andeyhun, 2014). Despite being among the highest-ranked countries in Sub-Saharan African in terms of dietary diversification, there is widespread malnutrition among children under the age of five Maxwell *et al.* (1998). This challenge has persisted for more than 20 years in Uganda (Mawa & Lawoko, 2018). It has also been noted that Kampala, the capital city of Uganda, has one of the highest poverty levels in Africa where 60 to 70 percent are urban poor

and about 75 percent of the urban households spend their income on purchasing food however there is still a decrease in food quantity and quality; it has also been stated that the increased urban poverty, high cost of food, rapid population growth and high unemployment levels have equally contributed to decreasing in food quality and quantity (see Drescher, 2004; Orsini *et al.*, 2013; Sabiiti & Katongole, 2014). Authors like (Drescher, 2004; Mugisa *et al.*, 2017; Orsini *et al.*, 2013; Sabiiti & Katongole, 2014) suggested the adoption of urban agriculture as a complementary livelihood strategy, particularly among the urban poor to address urban poverty and improve wellbeing, given the fact that 15.2 percent of the population is urbanised and rising with most urbanised Ugandans finding themselves in Kampala and surrounding areas. Literature reports show that some urban dwellers have resorted to food production like vegetable production in their backyard (backyard gardens) to get their own food and also to cope with space constraints (limited land) (see Azuba, 2002; Sabiiti *et al.*, 2014; Sabiiti & Katongole, 2014).

Among the main leavy greens grown by urban farmers include spinach, *Solanum aethiopicum* (Nakati) or bitter tomato, kale (sukuma wiki), cabbage and doodo (*Amaranthus*) (Kansiime, Karanja & Alokit, 2016). *Amaranthus* is one of the most planted African leafy vegetables in Africa and East Africa; it is also cultivated and consumed globally in Asia (Achigan-Dako, Sogbohossou & Maundu, 2014; Kumar Maurya & Arya, 2018; Mwaura, Muluvi & Mathenge, 2019; Shu'aibu, *et al.*, 2017). *Amaranthus dubius,* locally as 'doodo', is traditional vegetable species in Uganda. *Amaranthus* is a multi-purpose crop, it can be produce grains and vegetables thus consumable in both its grain (cereal) or vegetable form (leaves) (Kansiime *et al.*, 2016; Muyonga *et al.*, 2010; Mugisa *et al.*, 2017; Sulaiman & Andini, 2016). *Amaranthus* is regarded as a cheap and good source of protein, vitamins and minerals; it is also known for its medicinal benefits such as the prevention of vascular disease, normalising blood pressure and cholesterol regulating levels; lastly industrial and Economic purpose (Achigan-Dako *et al.*, 2014; Ainebyona, *et al*., 2012; Esan, Omoba & Enujiugha, 2018; Kumar Maurya & Arya, 2018; Onyango, 2010; Sulaiman & Andini, 2016; Wu *et al.*, 2000). However, it is important to note that micronutrients in vegetable and grain *amaranth* are different. Literature reports have shown that grain *amaranth* has a unique composition of proteins, lipids and carbohydrates; it also has a higher protein quantity compared to other grains like maize (Bjarklev, Kjærgård, Jelsøe, *et al.*, 2019; Esan *et al.*, 2018; Shukla, Srivastava, Suneja, *et al.*, 2018) while the vegetable *amaranthus* is rich in vitamin C and pro-Vitamin A, iron, zinc and calcium(Ochieng *et al*., 2019). Esan *et al.*, (2018) study showed

empirical evidence of the high amount of protein and amino acids in biological chemical and nutritional compositions of *Amaranthus Cruentus* (grain *amaranth*). This finding established that nutritional value was not only acceptable to Food and Agriculture Organization (FAO)/World Health Organization (WHO) 2007 standard recommended level but also capable of fulfilling protein requirements of an adult human being (Rastogi & Shukla, 2013). Also, high content of essential amino acids especially the lysine, calcium, iron, potassium, phosphorus and vitamins A, C, E and folic acid found in *amaranth* grain than other cereals/grains or pulses like maize and wheat which makes it suitable for complementary weaning food for infants since it is a good substitution for meat-and-bone food thus making it fit for both infants and adult consumption (Aderibigbe, Ezekiel, Owolade, *et al.*, 2020; Ainebyona *et al.*, 2012; Esan *et al.*, 2018; Johanita, 2015; Kumar Maurya & Arya, 2018; Muyonga *et al.*, 2008; Shukla *et al.*, 2018). *Amaranthus* also has production advantages of the vegetable *amaranth* are that leaves can be harvested after four weeks and can be harvested throughout the year (Achigan-Dako *et al.*, 2014). Unlike *Nakati* which has a low germination rate and a maturity cycle of 8 weeks (AVDC, 2008). *Amaranthus* is also able to thrive in relatively small spaces (Ainebyona *et al.*, 2012; Sulaiman & Andini, 2016) and can even be grown in plastic bottles, old tyres, pots or even plastic bags (Mulondo, 2016). Its production cost is also low given its relatively low fertiliser requirement, its ability to withstand harsh climatic conditions such as drought, and its resistance to pests and diseases (Ainebyona *et al.*, 2012; Rastogi & Shukla, 2013). This is unlike *Nakati*, which requires warm, humid and optimal water conditions (Sunseri *et al.*, 2010).

1.1 Problem statement.

During the last couple of decades the importance of urban agriculture has increased (Averbeke, 2007; Binns & Lynch, 1998; Maxwell, 1995; Nugent, 2000; Rogerson, 1992; Sawio *et al.*, 1994; Sebata, Mabhena & Sithole, 2014; Webb, 2011). However, there is a substantial knowledge gap in agriculture as practised in urban spaces. This study looked at *amaranthus* as a case study of urban agriculture in an African city Kampala. There has been an increased campaign for increased consumption of the African leafy vegetables (vegetable *amaranth*) and grain *amaranth* to address undernutrition and micronutrient deficiencies; also among the local smallholder farmers particularly in urban areas as an opportunity to improve their income in East Africa (Ainebyona *et al.*, 2012; Ochieng *et al.*, 2019). Authors Kansiime *et al.*, 2018; Muyonga *et al.*, 2010, reported

that *amaranthus* has the potential to improve diets, income levels, food and nutritional security and livelihoods among vulnerable populations thou the authors' observed low-level cultivation engagement and marketing is low. However, these studies focussed on the nutritional benefits of *amaranth* and production of the crop in general in the rural and peri-urban areas of Uganda and did not focus on urban agriculture, or Kampala specifically. *Amaranthus* is an under-valued crop given that urban farmers do not fully exploit its potential household benefits in Kampala (Muyonga *et al.*, 2010; Kansiime *et al.*, 2018). Since previous studies have emphasised biological and nutritional value, crop variety improvement, cultivation but less attention has been paid to the economic benefits of *amaranthus.* This study explores the *amaranthus* growing in the urban setting and the economic benefits of *amaranthus* among urban farming households in Kampala. Some literature reports showed the economic importance of *amaranthus* in Nairobi, this could play a fundamental role in urban household livelihoods in eradicating poverty among the urban poor in Kampala. Therefore, this research study employed a Sustainable Livelihoods Approach (SLA) to establish the potential of *amaranthus* as a livelihood strategy for the poor urban dwellers to meet their desired livelihood outcomes. It hypothesised that urban farmers in Kampala could enhance their household livelihood through increased production of *amaranthus.*

1.2 Objectives of the study

The primary objective of the study is to assess the potential of *amaranthus* growing in enhancing urban household livelihoods in Kampala. Morse and McNamara, (2013) suggested that to try to improve livelihoods, and there must be an understanding of what is needed, which involves the appreciation of the diverse factors and process that comprise livelihoods. Therefore, the objective was obtained by using the Sustainable Livelihoods Approach (SLA). In three specific objectives namely;

- One, identify the assets used, thus capturing the current production structure of *amaranthus* growing among urban households
- Two, access the role of institutions and markets in urban agriculture particularly *amaranthus* growing households.

- Three, examine the livelihood outcomes through the contribution of growing *amaranthus* from urban households.

1.3 Delimitations of the study

- Small sample size; due to inadequate information on the population of amaranthus growers in Kampala, a minimal sample size technique was used to come up with a sample size of 120. This sample size might not be representative of all *amaranthus* growers in Kampala; hence, results should be carefully interpreted before conclusions are drawn from them for the whole of Kampala city.

- Due to inadequate information on *amaranthus* farmers, there was no clear map out of where these farmers should be located. Snowball purposive sampling technique was therefore used to identify farmers, i.e. participants referred research assistants to fellow farmers known by them. This made the data collection process tedious and time-consuming, and also this referral mechanism streams bias.

- Financial constraint was a limitation as well, because of the high and unexpected costs incurred when this research was carried out. Some of the expenses include transports costs to the collected data from the participants and recruitment of research assistants.

1.4 Study outline

This study consists of six chapters. The first chapter look at the problem statement, objective of the study. Chapter 2 provides a conceptual and theoretical framework with a general overview of urban agriculture, growing *amaranthus* and policies in the context of Kampala. Chapter 3 consists of the data and methods that were used in this study. Chapter 4 provides findings comparison of *amaranthus* growing urban household (*amaranthus* growers) and non-*amaranthus* growing urban household (non-*amaranthus* growers) from the survey. Chapter 5 looks exclusively at *amaranthus* growing urban household. Chapter 6 looks at the conclusion, summary and recommendations.

2 Literature Review

This chapter comprises two sections; the conceptual and the theoretical framework. The chapter started by providing a clear and concrete background for this research study. Some of the themes that were addressed in this chapter include, an overview of urban agriculture and an overview of growing *amaranthus*. After that, the theoretical framework followed with an overview of the sustainable livelihood approach and framework with an emphasis on the household level.

2.1 Conceptual framework

The conceptual framework was used to conceptualise significant concepts of urban agriculture and *amaranthus* growing. The significant concepts were used to construct a conceptual framework. Later in the literature, a detailed breakdown of these concepts, including the history, definitions of each of the above concept, and the relevance of these concepts to this research study were discussed.

2.1.1 Urban agriculture

In this section, urban agriculture and urban farming was used interchangeably. Before going into the literature, I give a history of urban agriculture covering what urban agriculture is, who urban farmers are, what are their practices together with factors that affect urban agriculture and what are reasons why urban farmers engage in urban agriculture.

Urban agriculture (UA) is defined as agriculture taking place within and around cities or urban areas focussed on the production of vegetables, crops and small livestock by urban households for either home consumption or sale on the market (Smith, J. & Nasr, 1996). Urban agriculture can take various forms depending on the participants or stakeholders, resources used, the purpose, quality of produce. These participants include low-income, medium and high-income households, i.e. men, women and children, NGOs, government, institutions (educational institutions, health centres, prisons and health centres) and international agencies (see Van der Merwe, 2003; Nugent, 2000; Prain *et al.*, 2010; Sabiiti & Katongole, 2014). Also, some studies have observed new upcoming small-scale subsistence (community gardens, home gardens, institutional gardens, allotment gardens, nurseries, rooftop gardening and cultivation in cellars and barns) and intensive

commercial agricultural production system in urban agriculture (specialised UA and forestry production, large-scale agro-enterprises and multifunctional farms) (Drescher *et al.*, 2006; Nugent, 2000; Swanepoel, 2017; Tillie *et al.*, 2014). Some actors in UA are in the form of suppliers, inputs and services, producers, transporters, processors, retailers, consumers, managers and promoters (see Mougeot, 1999 and Van der Merwe, 2003). UA typically involves the use of city water, poor agricultural practices, intensive farming practices (rooftop gardens, vertical gardening and floating gardens) and post-harvest handling highly perishable products, crops with short cycle crops and of high value and fresh produce like vegetables, milk and eggs to feed urban dwellers (Belete & Mariga, 2005; Nugent, 2000; Orsini *et al.*, 2013; Tillie *et al.*, 2014; van Veenhuizen, 2006b).

Crops are often grown on various types of land at the disposal of the urban farmer both within or beyond the confines of his or her homestead or beyond it in valleys, wetlands, encroached on undeveloped land left to fallow by landowners, under power lines, road and railway reservations, rooftops, waste disposal sites and others (Abang *et al*., 2014; Kiguli. N *et al*., 2003; Sabiiti *et al*., 2014).

Urban agriculture is characterised by various agricultural practices, and these vary in every region as namely: mixed farming system, extensive monocropping systems, shift cultivation, intensive horticultural and innovative cropping system (see Orsini *et al.*, 2015; Belete & Mariga, 2005; Holmer & Laquinta, 2006; Lemeilleur, Temple & Kwa, 2003; Sawio *et al.*, 1994; Stephanie, 2015; Van der Merwe, 2003)

2.1.2 History of urban agriculture in Kampala

Agriculture has traditionally been restricted to rural areas, but recent studies show that there has been a shift to agricultural production practised in urban areas (see for example Drescher, 2004; Binns & Lynch, 1998; Freeman, 1991; Maxwell, 1994; Sawio *et al*., 1994; Van der Merwe, 2003). Before the early 1960s, urban agriculture was globally viewed as an essential activity especially in times of economic crisis and difficulties, but the activity was seen widespread in the later years across countries like China, Brazil, Ghana, India, Zimbabwe, Zambia, South Africa and Uganda for various reasons, for example, Government policies like nutritional self-reliance, utilising idle land and urban waste and post-Apartheid activity (see (Orsini *et al.*, 2013; Binns & Lynch, 1998; Maxwell, 1995; Mougeot, 1996; Nugent, 2000; Rogerson, 1998; Van der Merwe, 2003).

In contrast to the history of urban agriculture in Kampala wherein 1964, it was initially prohibited and had no legal framework and support (Musiimenta, 2002; Sabiiti *et al*., 2014; Kiguli *et al.*, 2003). However, urban agriculture gradually widespread from the early 1970s. During Idi Amin regime (1971-1979), the formal economy began to decline and was aggravated by the expulsion of the Asians (Indian minority) from Uganda which was an attempt by the regime to attain economic independence or known as the "war of economic independence". Uganda's economy was further worsened by the liberation war of 1979 and closely followed by impacts of structural adjustment policies. All these crises lead to the rise of the informal sector, unemployment and a fall in real income and as result, many urban households took up urban agriculture as a coping strategy (see Kiguli. N *et al.*, 2003; Maxwell, 1994, 1995; Sabiiti & Katongole, 2014). Later in 2004, urban agriculture received support from the Kampala Capital City Authority (KCCA) which by then was Kampala City Council (KCC). KCCA is the governing body of Kampala and acts on behalf of Uganda's central Government. This was attributed to through advocacies, initiatives and the participation of research organisations and international bodies like International Development Research Centre (IDRC) and Consultative Group on International Agricultural Research (CCIAR) and United Nations Development Programme (UNDP) attributed to the popularity of urban agriculture (Orsini *et al.*, 2013; Prain *et al.*, 2010). This support towards urban agriculture created an environment for its legalisation and in 2007, the new law was gazetted that allowed involvement of urban farmers and food handlers in a more supportive framework (Prain *et al.*, 2010; Sabiiti *et al.*, 2014). Previous, in 2003 studies showed that the increasing population growth and poverty levels in Kampala has made the practice of urban agriculture popular among the urban poor as a source of income, source of food, means of reducing food costs and it has shifted from the most impoverished urban dweller to low and medium earners (Kiguli. N *et al.*, 2003). Other literature reports have discovered that not only has UA practise moved from low-income group to medium but the shift is now to high-income households (Prain *et al*., 2010; Sabiiti & Katongole, 2014).

2.1.3 Reasons for practising Urban Agriculture

Urban agriculture is said to play a role in alleviating poverty and determining urban diets (see Badami & Ramankutty, 2014; Orsini *et al*., 2013; Sabiiti *et al.*, 2014; Ayeni *et al.*, 2018; Belete & Mariga, 2005). It was also claimed to have 800 million urban dwellers worldwide engaged, with about 200 million of the urban dwellers engaging in urban agriculture for commercial purpose

(UN, 2013; UNDP, 1996). According to Nugent (2000), households engage in urban farming for various reasons include; enhancing household food suppliers, the need to produce for home consumption, economic crisis, higher prices of market food and income enhancement. Furthermore, literature reports stated by different authors mentioned other national and economic reasons for taking up UA were listed namely; the high levels of poverty, reducing transport costs and waste management, fulfilment of cultural expectations, food insecurity, the duration/ time of stay in urban areas, low level of education, and high unemployment rate prompt people in urban areas to engage in urban farming as seen in various regions like South Africa (see Abang *et al.*, 2014; Belete & Mariga, 2005; Binns & Lynch, 1998; Drescher, 2004; Guyer, 1987; Lennard & Haysom, 2012; Lewcock, 1995; Maxwell, Levin & Csetse, 1998; Maxwell, 1995; Mougeot, 1996; Musiimenta, 2002; Nugent, 2000; Prain *et al*., 2010; Rakodi, 1985; Sawio *et al.*, 1994; Simiyu & Foeken, 2014; Webb, 2011; Van der Merwe, 2003; Swanepoel, 2017).

According to Van der Merwe (2003), there are factors that constraint urban agriculture, i.e. social, economic, physical, environmental and institutional constraints. These factors include access to natural resources like land and insecure land tenure systems (Austin & Visser, 2002), lack of credit facilities, political differences, theft of the crops, environmental pollution, climatic conditions, consumer income levels, lack of support and improper coordination from authorities without the positive response to the mentioned factors, the practice of agriculture is constrained (Swanepoel, 2017) (JW Swanepoel, 2017; Lewcock, 1995; Mougeot, 1999; Nugent, 2000; Orsini *et al.*, 2013; Sabiiti *et al.*, 2014; Simiyu & Foeken, 2014)

2.1.4 Urban agriculture in Kampala

In 2013, it was reported by World Bank Development Indicators that 60 per cent of Uganda's population (both men and women) are employed by the Agricultural sector (Ali *et al.*, 2016). Furthermore, there was an observation made by FAO and (Sabiiti *et al.*, 2014) that the majority of the urban farmers are female and children (Kiguli. N *et al.*, 2003). Authors Maxwell and Lee-Smith observed the existing classification of farmers in urban agriculture which included commercial farmers, food self-sufficient farmers, food security farmers and survival farmers (see Maxwell, 1995; Sabiiti *et al.*, 2014; Prain *et al.*, 2010). Urban agriculture was classified into four farming styles, urban old, urban new(dense slum), peri-urban in transition and peri-urban (peripheral) (Sonii *et al.*, 2010). According to (Prain *et al.*, 2014), commercial farmers produce

crops for the urban market and are found in the peri-urban periphery; food self-sufficiency farmers produce for household food consumption and are found in inner urban areas; food security farmers are referred to as middle-income households that practice UA as a secondary form of employment and source of food together with other sources of income; survival farmers largely practise UA to avoid hunger where the majority of the farmers are female-headed households and have limited economic options. Urban agriculture in Kampala has mainly been carried out in the form of vegetable production and livestock keeping, and the activity in the city has played an important role in both nutritional and food security. Some of the common vegetables grown include; leafy greens, cabbage, tomatoes, onions and bitter tomatoes (see Sabiiti *et al.*, 2014).

Urban areas are said to face a lot of competition for land, high food prices and demands which have been similarly seen in Kampala (Sabiiti *et al.*, 2014; Nugent, 2000). Over the years, there has been an increase in the urban population from less than one million persons in 1980 to about 3 million people in 2002 and 7.4 million people in 2014 (UBOS, 2018). Kampala's issue at hand is the population pressure due to the migration of people from rural to urban areas seeking better opportunities or employment opportunities which has led to the increased population in the urban areas. As people move to these urban areas, it comes as a reflection of poverty-driven livelihood strategies, and this has created increased urban poverty in these urban areas (see Prain *et al.*, 2010). Additionally, this migration of people has contributed to food insecurity because the increase in urban population caused the increased demand for food so the available food ratio is less compared to the increased population. Therefore urban dwellers have opted for urban agriculture as a livelihood strategy as a way of coping with food insecurity and high unemployment, mainly structural unemployment (Sabiiti & Katongole, 2014). Between 2009 and 2010, it was reported by Uganda Bureau of Statistics that the unemployment rate was at 4.2 percent of Uganda's total population and in 2012, it was reported by Action Aid International Uganda that the 34 percent of youth in the urban areas were unemployed (Jansson, 2017). According to Nugent (2000), increased unemployment rate in urban areas breeds ground for an informal sector in the search to earn a living which outlooks the existing formal sector and Sabiiti, 2014 reported the unemployment in Uganda created room for an informal sector where people have resorted to urban farming rather than waiting on jobs in the formal sector, this has played a fundamental role in the increased number of urban dwellers practising urban agriculture.

Additionally, Kampala has got an informal land market, and lack of access to land has affected the practice of urban agriculture(Sabiiti *et al.*, 2014). Currently, there are four main types of land ownership on the land market namely; customary, *mailo*, freehold and leasehold (MLHUD, 2013). Customary land ownership is where land can be individually, or family-owned under customary regulations, i.e. clan heads or elders (Pedersen *et al.*, 2012). Freehold land ownership system was previously the crown land which was owned by the Queen of England, and now ownership is as a result of one purchasing the land upon agreement between the buyer and seller in exchange for a certificate of a title that gives the owner all the rights to the land. *Mailo* land is referred to as a form of freehold tenure where British colonialists allocated land to tribal chiefs and can only be leased to specific individuals, in a particular period upon the landlord's agreement (Okuku, 2011; Rukundo & Kirumira, 2014). Leasehold land ownership is where land is owned, and rights are granted for a particular period by individuals or institutions or local authority upon annual payments while other forms of land ownership include borrowing and renting that is on monthly payments, short term secure property rights and usually characterised by the small sizes (see Pedersen *et al.*, 2012). The predominant land ownership in Kampala are customary and freehold that are associated with cultural restriction and high prices respectively (Howard & Nabanoga, 2007; Kiguli. N *et al.*, 2003; Paula *et al.*, 2015; Pedersen *et al.*, 2012). This has mostly affected poor households and women that have been excluded because of the inability to afford land Sabiiti *et al.*, (2014), while most women access to land is limited to the virtue of male relations (Kiguli. N & Kiguli, 2004) and others occupy marginal lands with low fertility which restricts high productivity. This land market has also significantly contributed to competition among agricultural and non-agricultural uses. As a result, urban dwellers are limited to back yard farming. According to Azuba (2002), it was estimated that 83 percent of Kampala households practice back yard farming on less than 0.4 hectares of land and 10 percent of the urban farmer plant on 1-3 hectares of land mainly in peri-urban areas. It has also been observed that some urban farmers are restricted to growing vegetables on tins, pots, sacks due to space constraint and also grows in their backyards (see Sabiiti *et al.*, 2014). The overall observation towards land use, agricultural location and land cost in this study are traced back to Johann Henrich Von Thunen' work, The isolated state. Von Thunen model considered land pricing, agricultural use, distance from the markets and the need to maximise profit by the farmer(O'Kelly & Bryan, 1996). Though the classic model was created in 1826 and translated in 1966, the Von Thunen model is still valid today and it made a good foot

place to bring more understanding to spatial location and different types of land use, land cost and transportation cost. Therefore, the model explains why the closer one gets to the city, the higher the prices of land which holds true for Kampala and the higher the returns required to bargain a particular land use for a (farming) activity (Cromley, 1982). Land is seen as a scarce resource in the urban areas and the adaption of intensive farming like backyard farming, the growing of perishable crops in close proximity to reduce transport costs and maximise profits (Swanepoel, 2017). This explains could justify why intensive farming typologies was adopted among the urban poor.

Urban agriculture is a supplementary contributor to urban dwellers, i.e. urban farmers and stakeholders along with the food supply and value chain by playing a fundamental role in the urban food system because of the available, close and constant amount of fresh food to the urban population (Musiimenta, 2002; Sabiiti & Katongole, 2014). Also, it plays a role in the recycling of crop and animal waste, which is given to the animals as feed, and in that way, waste is properly managed and handled. This is done by KCCA with most of the waste composed of vegetable matter (see Sabiiti *et al.*, 2014). However, urban agriculture faces some of the constraints faced is the issue of flooding, encroachment on the agricultural lands, poor waste disposal and management, land shortage (informal land market) and lack of support from the authority with the everyday food market. Due to the improper drainage system, Kampala faces a lot of flooding during the rainy seasons, and this is a health concern to the urban dwellers because they are left susceptible to disease outbreak due to the poor damage and waste management. Farmers face vegetable losses in the torrential rain downpour since there are washed away with floods (see Sabiiti *et al.*, 2014). It has also been noted earlier that as much as urban agriculture has significantly been advocated by IDRC, CCIAR and UNDP, the traders face a lot of resistance by KCCA in the form of selling their produce (Sabiiti *et al.*, 2014).

2.1.5 The policy response to urban farming in Kampala

As stated earlier, in 1964, any form of practice of urban agriculture (both home production and selling) in Kampala was strictly forbidden and considered illegal. The 1964 Town Planning Act gave a mandate to the Local Urban authorities to enforce regulation for ‘development control’ in their areas jurisdiction and on these grounds, Kampala City enforcement officials were given

authority to enact any form of UA since the activity was considered at odds with the urban standards; however, this activity continued to spread in later years illegally (Kiguli. N *et al.*, 2003; Sabiiti & Katongole, 2014; Sonii *et al.*, 2010). It was widespread due to the economic crisis and structural adjustments changes. During this time, the Government of Uganda through KCCA considered it illegal to practise any form of agriculture in urban areas because they had a negative perception towards urban agriculture that was deemed as a threat to public health and was it was seen as of no economic significance (Sabiiti *et al.*, 2014; Sonii *et al.*, 2010). About 40 years after, urban agriculture was considered and recognised as a beneficial activity to urban households since it offered nutritional and food security and this came later (Maxwell, 1994) strongly recommended the uptake of this activity and called upon the authorities to review and legitimise of urban agriculture in Kampala. In 2006, UA received legal support from KCCA, under the leadership Mayor of Kampala city (His Worship John Ssebana Kizito), five laws or ordinances (urban agriculture, livestock and companion animals, milk, fish and meat) were put in place to give licenses, govern and regulate crop and livestock production, it also regulates marketing and trade activities in Kampala and UA also receives support from government programmes like Poverty Eradication Action Plan (PEAP) and NAADS (National Agricultural Advisory Services)(Sabiiti & Katongole, 2014). The ordinances were drafted in 2006 and still being used up to date, they are referred to as guidelines that should be followed to practice UA. According to KCCA, under this ordinance, ordinance 5 also known as urban agriculture ordinance, it is mandatory to obtain an urban agricultural permit and licence. A fee payable upon issuing of the permit and failure to have this permit, the engagement of UA and commercial agriculture is forbidden. Also prior to issuing both the permit and license, the agricultural activity that will be taken up should be among KCCA's listed activities and an investigation is done by KCCA on the premises that will be practising commercial UA. However, the similar law prohibits commercial agricultural activities that are carried out in the following areas: abandoned landfills, greenbelts, wetlands, road reserves and other areas deemed to be toxic and yet basing a previous study by (Kiguli. N *et al.*, 2003), these areas that were previously used by landless women to cultivate their crops (see Sabiiti *et al.*, 2014).

Despite KCCA legitimising urban agriculture and ordinances that were put in place, it has been observed that situation has been made worse-off because women are forced to use the small spaces available and their backyards thus limiting production and at the same time and yet ordinances do not address the issue of access to land. Additionally, KCCA does not support the food market

produce for the products produced by these farmers and considers it illegal to trade fruits along pavements and roadside (Sabiiti *et al.*, 2014). Overall this shows that institutional support is minimal, according to the (DFID, 2000a) framework, institutional support and access to land are considered essential to achieve a sustainable livelihood.

2.1.6 *Amaranth* growing.

According to Suma *et al*., (2002), there are about 400 species of *amaranthus,* but about 60 species are cultivated worldwide (Achigan-Dako *et al.*, 2014; Esan *et al.*, 2018; Muyonga *et al.*, 2010; Onyango, 2010) and among the species mentioned above 20 species of *Amaranthu*s are edible, i.e. 17 species of edible leaves, for example, *A.dubius, A. lividus, A. hybridus. A. hypochondriacus, A. spinosus, A. thunbergii, A. tricolor, A. viridis* and *A. blitum*; and three-grain *amaranth* species that belong to pseudocereals with edible seeds like *A. hypochondriacus, A. caudatus and A. cruentus*(Grubben & Denton, 2004; Kumar Maurya & Arya, 2018). It was also observed by Onyango (2010) vegetable *amaranth* namely *A. tricolor, A. dubius, A. lividus and A. hybridus and* that some species serve the same purpose as both grain and vegetable like *A. hypochondriacus,* and also, *A. cruentus* (Muyonga *et al.*, 2010). It is believed that some *Amaranthus* originated from the south and Central America, while other species are from Europe, Asia, Africa, and Australia (Wu H *et al*.,2000). *Amaranthus* is often grown in the tropics and temperate regions, and it can as well be cultivated as a green leafy vegetable or as a grain while in other parts of the world it is used as an ornamental (see Achigan-Dako *et al.*, 2014). *Amaranthus* is one of the most planted African leafy vegetables in Africa and East Africa. It has been greatly attributed to its low cost of production (see Achigan-Dako, Sogbohossou & Maundu, 2014). It is suitable for both human consumption and animal feed (Esan *et al.*, 2018; Kumar Maurya & Arya, 2018; Molina *et al.*, 2015; Onyango, 2010). It is grown in different countries across the globe; Sub-Saharan countries (Kenya, Ghana, Zimbabwe, Ethiopia, Senegal, Uganda), South Africa, southeast Asia, Mexico, South America and Central America (Aderibigbe *et al.*, 2020; Esan *et al.*, 2018; Muyonga *et al.*, 2010; Onyango, 2010; Shukla *et al.*, 2018).

Currently, in Uganda, the common *amaranthus* varieties include grain and vegetable, i.e. grain *amaranth* namely; *A. hypochondriacus, A. caudatus and A. cruentus* and vegetable *amaranth* namely; *A. dubius, A. lividus, A. tricolor, A. viridis, A. cruentus* and *A. blitum* (Achigan-Dako *et al.*, 2014; Kansiime *et al.*, 2018; Muyonga *et al.*, 2010; Ssepuuya, Katongole & Tumuhimbise,

2018). *Amaranthus dubius* is a part of the Amaranthaceae family and is among the leading leafy vegetable grown in Kampala. It is described as terminal inflorescence spike-like with the broadly triangular blade down leaves; female five tepals and dehiscing circularly blackish seeds and it thrive under 25℃ day and 15℃ night temperature with fertile well-drained soils of less than six pH (Achigan-Dako *et al.*, 2014). *Amaranthus* is often referred to as a weedy species (Onyango, 2010) and it usually grows in lowlands like waste places, riverbanks, roadsides, cleared forest and flood plains. Grain *amaranth* belongs to a nutritious class of pseudocereals, the seeds are small in size (0.9 – 1.7 mm of diameter), lenticular in shape, 1000 seed weights from 0.6-1 g. Since there are many varieties, the seed colour varies from gold, white, pink and brown to black(Ainebyona *et al.*, 2012; Esan *et al.*, 2018). Empirical evidence shows that different *amaranthus* has different nutritional value; *amaranthus dubius* contains 3.5 g of protein, 3.1 mg of vitamin A, 78mg of vitamin C, 582mg of calcium, 3.4 mg of iron and 1.5mg of zinc. One of the highest nutritional value in vitamin C, calcium and zinc compared to other *amaranthus* and grain *amaranth* (*A. cruentus)* 3.2g of protein, 1.8mg of vitamin A, 36mg of vitamin C, 305mg of calcium, 3.8 mg of iron and 0.7mg of zinc (see Achigan-Dako *et al.*, 2014). Similarly seen by Esan *et al.*, (2018) study, the grain *amaranthus* has a high content of essential amino acids especially the lysine, calcium, iron, potassium, phosphorus and vitamins A, C, E. Biological chemical and nutritional compositions; protein amount of (15.5 and 16.1 percent), and amino acids (32.84 and 32.90 g/100g).

Vegetable *Amaranth* is used as a delicacy in other countries like Kenya, Tanzania, India and the grain *Amaranth*, for example, *Amaranthus cruentus and Amaranthus caudatus* in countries like Zimbabwe, Kenya, Uganda and Ethiopia. It is said to help in balancing vitamin and mineral intake, and it is also seen to contain antioxidants (see Onyango, 2010). Authors Achigan-Dako *et al.*, (2014) observed the alternative use of vegetable *amaranth* as a medicinal plant in countries like Senegal, Ghana, Sudan, Gabon and Ethiopia most especially among children and lactating mothers. It is used for treating constipation, fever, wound dressing, treating pains in the limbs, anaemia, kidney complaints and haemorrhage. While the grain *Amaranth* is used as a recipe in baking or eaten as a cereal and adds biological value to blended food (Achigan-Dako *et al.*, 2014; Muyonga *et al.*, 2010), it is also equally a good source of minerals like vegetable amaranth. In South Africa, grain *amaranthus* is grown for commercial purpose for canning and sold in supermarkets (Aderibigbe *et al.*, 2020). There has been an increased campaign for increased

consumption of African leafy vegetables and grain *amaranth* to address undernutrition and micronutrient deficiencies. Also, there is an advocacy for local smallholder farmers in urban areas to take up vegetable production like *amaranthus* to improve their income (Ochieng *et al.*, 2019). This has been done in countries like Rwanda, Uganda, Malawi and Tanzania through partnerships between research institutions and local NGOs like the Promotion of Neglected Indigenous Vegetable Crops (IV) for Nutritional and Health in Eastern and Southern Africa (ProNIVA) project led by the World Vegetable Center (AVRDC). It was similarity done in Botswana, Cameroon, Kenya, Senegal and Zimbabwe through Bioversity International's African leafy vegetable programme (Achigan-Dako *et al.*, 2014). However, previous studies have emphasised biological and nutritional value, crop variety improvement, cultivation but less attention has been paid to the economic benefits of *amaranthus* where countries like Mexico, Nairobi and Nigeria it has been taken up as a livelihood, especially among the small-scale rural farmers. (Bjarklev, Kjær & Kjærgård, 2008; Esan *et al.*, 2018; Onyango, 2010).

Amaranthus is a crop of interest in this study because of its health, economic and social-economic benefits, especially among women and children and also the crop's ability to strive in small spaces. The plant has got exceptional qualities, for example, its edibility of both the grains and the leaves, in this way farmers can sell both the grains and the leaves. However, this crop is under-valued. A study conducted in Mexico mentioned that growing *amaranthus* has the potential to play a fundamental role in fighting poverty, improving food security and refining the lives of the farmers Bjarklev, Kjær and Kjærgård (2008). In Nairobi, *amaranthus* has played an economic role by providing a source of income because it can be sold either as fresh produce to formal and informal markets or value-added products to retail shops or supermarket, the potential of turning from small-scale vegetable growing into a viable business enterprise similarly in Uganda, the *amaranthus* products are sold in urban retail supermarkets as seen in (see Besong *et al.*, 2001; Achigan-Dako, Sogbohossou & Maundu, 2014; Onyango *et al*., 2008; Mwaura, Muluvi & Mathenge, 2019). *Amaranth* is also considered a profitable crop and of economic importance because of the profitable economic returns, there are reports from Nigeria were vegetable *amaranth* (*A. cruentus*) production costs i.e. Variable costs (labour, seeds, fertilizers, insecticide, fuel, lubricant) and fixed costs (Pump, water hose, sprayers, seed containers, hoe, sickles/knives and rent). Return to Naira invested of 0.71; net farm income of 213,965 Naira per hectare approximately 535 dollars (1 Nigerian Naira = 0.0025 USD) (Shu'aibu *et al.*, 2017). In Nairobi, vegetable *amaranth (A. cruentus*

and *A. hybridus*) production costs varied from those hired land and own land, application of different fertilizers like DAP (fertilizer) and manure thou labour was a constant to different households engaged in growing *amaranthus*. Thus, the estimated income differed from KSh 483,273 with hired land and labour to KSh 498,140 with own land and labour; a bundle was sold at Ksh. 13.90 at the supermarkets; gross earnings of KSh. 752.00 (10.70 USD) per delivery of vegetable *amaranth* (Onyango, 2010). In Uganda, vegetable *amaranth* (*A. lividus*) production cost (inputs and labour); the price of 1000 Ugx per bundle; the value of production 536,000 Ugx; gross margin 226,325 Ugx and 44,600 Ugx returns per day based on 0.25 acre of land. Also, it is important to note that they are some farmers that concentrate on growing *amaranth* for seed production and it was noted that seed producers receive higher gross margins (Kansiime *et al.*, 2018). This shows how *amaranthus* equally is a fundamental and contributing factor to income among farmers and household livelihoods; it also similarly seen in another report (Mwaura *et al.*, 2019). *Amaranthus* has got the potential of turning from small-scale vegetable growing into a viable business enterprise as seen in (Besong, Samalang and Abia, 2001). The crop can be a sustainable livelihood strategy for Kampala farmers to equally take advantage of the opportunities, especially along the value chain and potential for export.

Currently, in Uganda, it has been noted that the participation of grain *amaranthus* is still low, although the vegetable amaranth is widely grown in Uganda. This was observed by authors (Muyonga *et al.*, 2010) in their report entitled 'Promoting production and utilisation of grain amaranth for improved nutrition and health in Uganda'. This report aimed at contributing to the improvement of livelihoods of resource-poor communities in Uganda through increased agricultural production of grain *amaranthus* increased consumption of grain amaranth and amaranth products together with the introduction of value-added products. Their project covered three rural areas, namely; Apac, Kamuli, and Nakasongola and highlighted that grain *amaranth* can be consumed as a grain and a vegetable. Grain *amaranth* can also be further processed into a paste form, roasted/popped snacks, porridge, an ingredient in the baking (see Muyonga *et al.*, 2010). The report findings showed that women are still dominant in growing *grain amaranth*, there was a positive effect on food security with the highest observed impacts in Apac, the second line was Nakasongola then Kamuli. This was attributed to the short maturity cycle, the ability to be grown on limited land and mostly because it can be consumed in various forms as mentioned earlier.

Furthermore, in the findings, the empirical evidence obtained showed that the areas with the highest grown grain *amaranth* had more access to land, and there were health benefits that came with the consumption of grain *amaranth*. In Kamuli, results showed that some people grow *amaranth* for medicinal purposes. However, there were challenges like the lack of seeds, drought, weeds, and pests, lack of awareness of different forms of consuming grain *amaranth* and marketing constraints. The report addressed the value-addition, which reaffirms livelihood interventions for a sustainable livelihood (Muyonga *et al.*, 2010). Though it did not address urban areas and no consideration was made for the utilisation of small spaces like the backyards or rooftops. Therefore, this research study looked at *amaranthus* in an urban area.

In the later years, research studies were done by Kansiime *et al.*, (2018) and Kansiime *et al.*, (2016) on derived demand for African vegetable seed and demand for African indigenous vegetables and seed in Uganda respectively. In the above-mentioned studies, the authors acknowledge *amaranthus* as one of the typical African Indigenous Vegetable (AIVs) grown and with a long history of domestication to African conditions, whose leaves are consumed as vegetables and can be a complement to staple-based diet thus supplementing nutritional food requirements to households (Grubben & Denton, 2004; Shu'aibu *et al.*, 2017). For example, in Kenya, vegetable *amaranth* is eaten as a side dish with *ugali,* or it is mixed with bananas also known as plantains, maize and beans as known as *kienyeji* in Kiswahili (Onyango, 2010). Studies have shown that vegetables are a good source of vitamins A, B and C, it is also known for having a high nutritional value which is rich in proteins and micronutrients (Achigan-Dako *et al.*, 2014; Mwaura *et al.*, 2019). This has been a similarity addressed by the authors Kansiime *et al.*, (2018), they noted the richness of iron, minerals, calcium, vitamin A and C in the vegetables and vegetable's ability to be used in scarce water supplies and soil nutrient, small space requirement, short growing cycle. This crop can also be grown all year round (multiple harvests), thus assuring food availability at the household level and income for commercial growers.

Additionally, the authors observed the decisive role of AIVs to dietary diversity, reducing food insecurity, high returns to labour and farm gate values per unit area compared to cash crops. Empirical evidence gathered by Kansiime *et al.*, (2016) showed that there were crucial challenges/constraints faced by AIVs; high cost of production, pests, and diseases, prolonged dry spells and high cost of production inputs, low market, low output price and price fluctuations.

While the empirical evidence from (Kansiime *et al.*, 2018) showed that *amaranths,* i.e. *amaranthus dubius* and *amaranthus lividus* were the most preferred vegetables and are good sources of food and income, the engagement of more households has increased on the demand of these vegetables (see Kansiime *et al.*, 2018). They also noted that some of the challenges faced with AIV are the poor quality of seeds which have been a persistent problem seen in all the above studies, i.e.(see Kansiime *et al.*, 2016, 2018; Muyonga *et al.*, 2010). Unlike the report done by Muyonga *et al.*, (2010) that stated the popularity of vegetable *amaranth*, another research study was done by Kansiime *et al.*, (2018) shows a limited number of urban farmers participating in the growing of *amaranthus* and according to the interviewed farmers, it is perceived to have low marketability thus the low level of engagement in its cultivation in urban areas. Both the above studies address AIVs, but this research study seeks to find out why the production of *amaranthus* is still low despite the advantages seen and its role in enhancing households' livelihoods.

As mentioned earlier, a study on *amaranthus* farming was done in Mexico; this study employed Sustainable Livelihood Approach in their findings, emphasizes *amaranthus* farmers taking up opportunities along the *amaranth* value chain, role of institutions, human and social capital in achieving sustainable livelihood as a way of enhancing sustainable livelihood (Bjarklev *et al.*, 2008, 2019). Thus, this research considered the Sustainable Livelihood Approach as a tool to achieve and enhance sustainable livelihoods.

2.2 Theoretical framework: Sustainable livelihood approach.

As noted earlier, 24.5 percent of Uganda's population is below the poverty line, and about 9.1 percent of this was from the urban population (UN Habitat, 2013). Thus, there is a need to use the Sustainable Livelihood Approach (SLA) as a tool to eradicate poverty among the urban poor. Urban agriculture was recognised as a livelihood strategy (Prain *et al*., 2010), this study looked at *amaranthus* growing as a part of an urban household livelihood strategy in Kampala. Therefore, Sustainable Livelihoods Framework (SLF) is used in this study, the framework was developed to be a guide to analyse household assets and strategies to reveal the trade-offs associated with diverging development paths and to focus on understanding the complex, local realities affecting development outcomes (Carney, 1998; Scoones, 1998, 2009). This framework includes information about the dimensions of capital that households employ and institutions and policies

that mediate household access and use of resources to achieve development outcomes (Kemkes, 2015).

2.2.1 Sustainable Livelihoods Approach.

Before looking at the Sustainable Livelihoods Approach in detail, it is important to define livelihoods and unit of analysis households. Then, the definition of SLA and where it was previously applied.

Chambers and Conway (1991: 5) defined a livelihood from the 1987 World Commission on Environment and Development (WCED) report as "adequate stocks and flows of food and cash to meet basic needs". Chambers (1987) stated a livelihood consists of livelihood capabilities, tangible assets, i.e. stores and resources and intangible assets, i.e. claims and access (Chambers, 1995). This definition has since been expanded to "a livelihood comprises the assets (natural, physical, human, financial and social capital), the activities and access to these (mediated by institutions and social relations) that together determine the living gained by the individual or household" (Ellis, 2000:10).

In this study, household-level was the unit of analysis in a livelihood. Households in the study are termed as a group of people living together under the same roof (Morse & McNamara, 2013a). Households are considered as a unit of analysis because of the critical aspect they play in the society towards decision making, and they are a bridge between reality and community at large. Also, the household is part of the micro-environment, whereas the external environment is referred to as the macro environment (see Mtshali, 2002). On that note, statistics show about 52 percent of the households considered subsistence farming as a primary source of livelihood and 2.2 percent of the households are practising commercial farming from the central region of Uganda including Kampala (Ali *et al*., 2016). Also, as noted earlier, urban agriculture in Kampala is taken up as a means of survival, household food consumption and secondary form of employment (see Maxwell, 1994; Prain, Gordon & Karanja, Nancy & Lee-Smith, 2010; Sabiiti *et al.*, 2014; Sabiiti & Katongole, 2014; Simiyu & Foeken, 2014)

According to Chambers (1995), household livelihoods are considered to be more diverse especially among the poor, it was also observed that the urban poor participates in diverse informal activities. This is because they are often characterised by different members of the family seeking various

sources of food, cash, support and other necessities of life in different ways, places and times of the year (Chambers, 1995). It has been observed that these livelihoods are often acquired from ownership of land, access rights to grazing land, stable employment (Chambers & Conway, 1991).

Various authors came up with different notions of Sustainable livelihoods (SL) like Chambers and Conway, (1991) suggested that for a livelihood to be sustainable "it should able to cope with stress and shocks, maintain or enhance its capabilities and assets, and provide sustainable livelihood opportunities for the next generation; and which contributes net benefits to other livelihoods at the local and global levels and in the short and long-term". However, the above definition was criticised by authors McCaston and Frankenberger (1998), that the definition of Sustainable Livelihood does not hold for all household because households response differently to the ability to cope with stress and repeated shocks especially the poor people who balance competing needs in complex ways. Also, Morse and McNamara (2013) criticise the authors' Chambers and Conway definition that the resilience to stress and shock may drift away from the element that makes a livelihood and the description likely implies to more diverse livelihood which should be approached with caution. Later in the early 2000s, sustainable livelihood was redefined by the UK Department for International Development (DFID) as a livelihood is

"sustainable when it can cope with and recover from stresses and shocks and maintain or enhance its capabilities and assets both now and in the future, while not undermining the natural resource base"(DFID, 2000a).

With the above noted, this study considered a more straightforward definition by Morse and McNamara (2013), sustainable livelihood as means of making connections between the day to day lives and methods by which we can sustain all these activities into the future without causing harm to other people's prospects on the way.

Furthermore, SL has been an area of interest to various international organisations like the United Nations/ UNDP, DFID and CARE (see Lasse, 2001). The UN aims to promote the Sustainable Livelihood concept and put emphasis on the fundamental importance in a bid to achieve sustainable development.

> "It is essential to generate decent jobs and incomes that decrease disparities in standards of living to better meet people's needs and promote sustainable livelihoods and practices and the sustainable use of natural resources and ecosystems" (UN, 2012:6).

Sustainable livelihood Approach (SLA) has been defined by different authors (Scoones, 1998; Chambers, 1995; Cortes, 2008 and Chambers & Conway, 1991). The SLA refers to a tool for development (Scoones, 1998 and Chambers, 1987), to bring a better understanding of livelihoods, especially of the poor, and it is aimed to eliminate poverty (DFID, 2000a), and used for analysing and planning development activities (Petersen and Michelle 2010). It has also been given credit for its holistic perspective on peoples' livelihood as it includes the poor at the centre of development (Simiyu & Foeken, 2014).

Sustainable Livelihood Approach (SLA) has been used for the poor rural population to attain sustainable livelihood to eradicate poverty, and this approach has been investigated in countries like Bangladesh, Ethiopia, Mali and Zimbabwe (Scoones, 1998); Other studies have been conducted using this approach on rural livelihoods for example; (see Koster, 2008; Mtshali, 2002). It has also been used in urban settings, for example, (see Simiyu and Foeken, 2014; Wachholz, 2017; Bianca, 2003; Swanepoel, 2017).

2.2.2 Sustainable Livelihoods Framework

Numerous studies have been done on SLA, which were inspired by early studies of Robert Chambers in 1980s (Chambers, 1987). It influenced other studies like (see, e.g. Chambers and Conway, 1991; Scoones, 1998; DFID, 2000; Cortes, 2008; Petersen and Michelle, 2010) that attempted to address the concept of SLA and what should be addressed to achieve sustainable livelihoods among the poor. Currently, the SL approach has got three agencies where it is applied. The three agencies include DFID, CARE and UNDP; they constructed DFID's Sustainable Livelihood Approach, CARE's Sustainable Livelihood Approach and UNDP's Sustainable Livelihood Approach respectively. However, my research study considered DFID's SLA against CARE and UNDP SLA because DFID's SLA is holistic, multi-level, puts people at the centre, participatory and sustainable; looks at the community level and macro-economic reforms; it is suitable for analysis since it is a basic framework for analysis; it brings an understanding of the various factors that affect or enhance livelihood outcomes and shows interrelated and influences

each other(Carney, 1998; DFID, 1999a, 2000a; Lasse, 2001; Morse & McNamara, 2013a). While CARE emphasizes empowerment at the community level as an essential dimension for eradicating poverty by strengthening the capability of poor people to take initiatives to secure their own livelihoods and UNDP's approach emphasizes introducing new technology and making social-economic investments and policy and governance issues to be addressed. Both CARE and UNDP are suitable for programming because they ease the planning of concrete projects and programmes(Lasse, 2001). One of the primary objectives of this research study is to bring an understanding of livelihoods, especially of the poor i.e. what is needed, which involves the appreciation of the diverse factors and process that comprise livelihoods(Morse & McNamara, 2013a).

In this research study, DFID's and Ian Scoones SLA frameworks were briefly looked at because of the similarity seen in (Scoones, 1998 and DFID, 2000).

SLA is a holistic and dynamic framework that encourages analysis through different sectors and acknowledges factors and influences and multiple livelihood strategies and outcomes, and it also tries to understand change over time and the complex action between various factors (Calvi, n.d.). DFID's Sustainable Livelihood Approach and Framework were then developed by the DFID to understand factors that affect people's livelihood and eliminating poverty in poorer countries (DFID, 2000a; UNISDR, 2010). In addition to that, the DFID framework provides a link between the microenvironment and macro environment and a participatory approach that puts people at the centre (Calvi, n.d.; DFID, 2000a). According to Petersen and Michelle (2010), participation is fundamental in the planning of development activities because of the inclusion of the poor, and it also gives an understanding of poverty. Therefore, the authors suggest that development must be done from the perspective of the poor; this will bring clarity on their priorities and perception of livelihoods that are undertaken. Also by doing this, not only is there need to command an understanding of poverty but wellbeing too so that the SLA can be used for analysing and expressing what the poor know, need and want (see Chambers, 1995). While Scoones (1998) looked at a broad aspect and more refined concepts with the inclusion of reality or practical ideas, the author's ideal SLA framework comprised of diverse contexts, a combination of livelihood assets/ resources which are put together to get various livelihood strategies. The author also stresses the socio-economic differences which have a significant impact on livelihoods, for

example, contrasts of asset ownership, income levels, gender, age, religious affiliation, social or political status and institution involvement.

One of the similarities seen, both studies appreciated the existence of institutions and recognised that these institutions influence sustainable livelihoods outcome, i.e. institutions shape the livelihood strategies took up by households because the favourability of these structures and processes towards accessing to different capitals mentioned above can make households to get involved in partaking a particular livelihood (see DFID, 1999; Scoones, 1998). The difference between these frameworks is that Scoones (1998) recognised socio-economic differences that have an impact on the structuring of livelihood; thus, one of the reasons as to why socio-economic differences among households were considered. However, this research mainly considered the DFID sustainable livelihood framework to understand the various dimensions of an individual's livelihood, strategies and objectives pursued and associated opportunities and constraints among the urban farming households.

The adopted framework from DFID (2000) placed below in figure 1 (DFID, 2000b) simplifies the framework into different elements; vulnerability context, livelihoods assets, transforming structures and process, livelihood strategies and livelihoods outcomes. The framework shows how all the elements mentioned above are interrelated and influence each other.

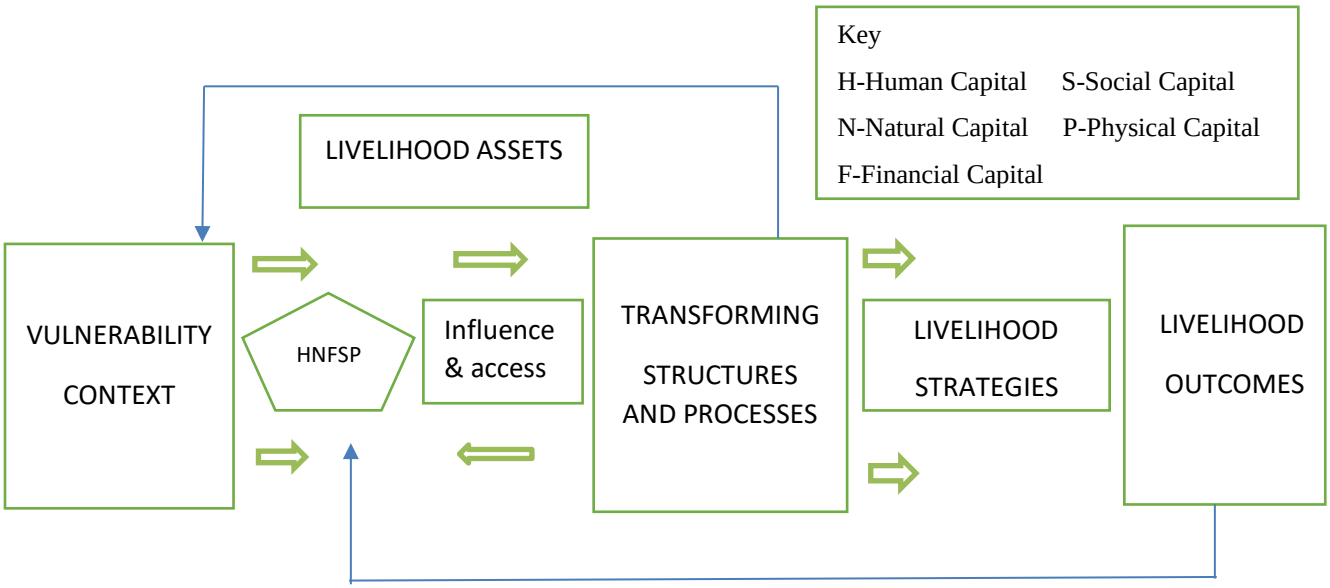

Figure 1 Sustainable Livelihoods Framework

Source: DFID (2000b).

The vulnerability context here looks at the external environment of livelihoods which include the shocks, trends, and seasonality, and often referred to as the external factors that influence people's livelihoods. This could mean household livelihoods are vulnerable to external stress and shock, trend and seasonality (see UNISDR, 2010). According to Chambers (1995), the vulnerability can also be externally or internally, thus exposure to shocks, stress and risks and defencelessness in terms of lacking the means to cope without damaging loss; stresses are usually predictable through distressing factors like declining wages or labour and natural resources like soil and water, while shocks are sudden and unpredictable, for example, natural disasters, wars and economic fluctuations. Also, shocks can as well be economical, natural, human health and crop or livestock health shock or conflicts and they are known to destroy assets. Trends include population, resource, national/international, economic, technological and governance trend (see Petersen and Michelle, 2010; Cortes, 2008). Seasonality is captured in various ways, and they are said faced by the poor in developing countries, i.e. seasonality of prices, production, health and employment opportunities (see DFID, 1999). Authors Chambers and Conway (1991) suggested that with the help of both tangible assets and intangible assets, households can cope with stress, shock and generate livelihood security.

"Household livelihood security is defined as adequate and sustainable access to income and resources to meet basic needs including adequate access to food, potable water, health facilities, educational opportunities, housing, time for community participation and social integration" (McCaston & Frankenberger, 1998).

Livelihoods assets are defined as "resources or capitals or what people have" (Koster, 2008) they include; human, natural, financial, social and physical capital which are essential to achieve a positive livelihood outcome (see Petersen & Michelle, 2010). Natural capital involves physical factors like land, good soil and water supply and it is necessary for those who derive their livelihoods from resource-based activities like farming, and they also face vulnerability inform of shocks and seasonality (DFID, 1999a). Agricultural activities require the availability of natural resources like soil, air and water that are acquired through different forms like land titles or membership in irrigation associations (Prain *et al*., 2010) and these determine and influence the choice of strategy one is likely to take on a specific livelihood. It was similarly observed by authors Morse and McNamara, 2013; and UNISDR, 2010, that the provision of resources is equally important because, with them, individuals can enhance and enjoy their lives. It justifies why some people take on agricultural livelihoods because of the presence of natural capital and human capital while others take up non-agricultural activities because of the presence of financial capital (Scoones, 1998). In addition to that, a report for the 1992 Earth Summit acknowledged that numerous people's livelihood especially the poor, depends on the ecosystem. Ten years after this Summit, other sitting, i.e. United Nations Conference in Rio de Janeiro took place that recognised the need to have sustainable livelihoods (UN, 2012).

As seen earlier, the poor tend to rely on natural resources which exposes the environment to environmental degradation thus the need to create sustainable livelihoods to protect the resources and as observed by the author (Rana, 2011). Human capital in form skills and knowledge like human labour varies at a household level according to the following factors, namely household size, skills and health benefits, and it is essential in the achievement of a sustainable livelihood (UNISDR, 2010). Social capital is in the form of networks and connectedness, membership of more formalised groups and relationship of trust, reciprocity and exchange; it is essential for the development of knowledge, to increase people's income and to save (Jacobs, 2009). Physical capital is the in the form of necessary infrastructure and producer goods, and it is considered a core

of poverty without the presence of particular infrastructure like poor transport infrastructure that limits the mobility of the essential products and inappropriate producer good can constrain people's productivity capacity (DFID, 1999b). Also, livestock is considered a physical capital (Prain *et al.*, 2010). Financial capital is in the form of flows and stocks are imperative to achieve the desired livelihood outcome (DFID, 1999a).

Transforming structures and process play a role in determining access to diverse assets, and they also form the livelihoods of the poor, these include the institutions, policies, organisations, markets and social relations (DFID, 2000a). Example of structures consists of the public sector (level of Government), private sector and banks that offer credit. Examples of process include laws, i.e. ownership rights to assets, culture and international agreements, respectively (Petersen & Michelle, 2010). The institutions are formal or informal and are known as regularised practices designed by rules and norms of society that have been persistent and widely used (Scoones, 1998). Institutional and organisational factors primarily influence sustainable livelihood outcomes and play a fundamental role in constructing a livelihood for example "*the success of urban agriculture in contributing both negatively and positively to the everyday lives of urban residents is often reliant on institutional decisions and processes*"(Van der Merwe, 2003: 22).

Livelihood strategies are defined as are dynamic processes in which activities are combined by the people to meet their human needs at different times (See DFID, 2000). Livelihood outcomes are defined as the output of livelihood strategies (DFID, 2000a) include more income, wellbeing, reduced vulnerability, improved food security (see Koster, 2008) and more sustainable use of natural resource base. The variation in the livelihood outcomes is because people seek livelihoods to meet different human needs (see Chambers & Conway, 1991; Petersen & Michelle, 2010).

The DFID model used in this study concludes by showing the availability of the assets, and institutions and policies that mediate household access and use of resources that guides households on what livelihood strategies to take on like agricultural production and therefore are essential for a sustainable livelihood outcome. It is also important to note that the livelihood outcomes can positively or negatively give eco-system feedback on the livelihood assets (see Prain *et al*., 2010). Therefore, it is relevant to find out the factors that affect urban farmers and suggest the appropriate policies and proper planning.

2.3 Conclusion.

This chapter looked at an overview of urban agriculture, *amaranthus* growing, policies in the context of Kampala, Uganda and the Sustainable Livelihood Approach (SLA). DFID's SLA model was used in this study which showed the framework that guides households on which livelihood strategies to take on like agricultural production and that are essential for a sustainable livelihood outcome. Also, SLA creates a better understanding of livelihoods to eliminate poverty. In conclusion, this brings me to an observation made, that to look at poor people's agency only is to ignore the actual problem which is the structural causes of poverty, i.e. power inequalities and unequal access to resources that affect livelihoods (see Simiyu and Foeken, 2014) and observe hindrance among households from achieving the underlying potential of sustainable livelihoods.

3 Data and methods

The previous chapter explored the literature and studies on urban farming with a specific focus on growing *amaranthus.* It has also reviewed the Sustainable Livelihoods Approach. This was aimed at bringing an understanding of the critical concepts of urban agriculture (growing *amaranthus*) and household livelihoods. This chapter provides an outline of the data and methods through which this research project was carried out. It includes the following subthemes; research design, sample size and technique, methods and tools of data collection, data processing and analysis.

3.1 Research Design

The study was used a mixed-method quantitative and qualitative research approach. The mixed research approach is the mixing of quantitative and qualitative research methods (Palinkas *et al.*, 2011). As noted earlier, the research study used the DFID's SLA or framework, because of its participatory approach of putting people at the centre. In addition to that, the framework brings understanding to the factors that affect people's livelihood; thus, the need to include different sectors like institutions' role in achieving a sustainable outcome. Therefore, the mixed research method was chosen to link the micro to the macro environment, i.e. factors that affect urban farmers with specific interest *amaranthus* as a household livelihood strategy and the role of institutions. Another advantage of using a mixed research methodology is that they are complementary to each other hence a firmer research method. This methodology has been advocated for by various authors like (see Mtshali (2002), Proctor *et al.*, (2009), Palinkas *et al.*, (2011)). It is also said to create a better understanding of research issues. The quantitative research design was used for continuous variables and was used largely for primary data from the survey and secondary data.

A qualitative approach was used to get a deeper understanding and exploring of the phenomenon as it is said to yield more rich cases of information and was used key informant interviews (see Naderifar, Goli & Ghaljaie (2018) and Palinkas *et al.* (2015)).

3.2 Study area

Located in East Africa, Uganda encompasses a total area of 189km^2. According to the 2014 Uganda population and Housing Census, Uganda had a population of 34.6 million; Kampala is the capital city of Uganda and situated in the central part of Uganda. Kampala City had a population of 1,516,210 with a growth rate of 2 percent (UBOS, 2018; UN Habitat, 2016). The city is surrounded by the highly urbanised districts of Entebbe, Wakiso and Mukono district. Kampala City is divided into five divisions as Nakawa, Makindye, Rubaga, Kawempe and the Central region as shown in Figure 2. In this study, four divisions were randomly sampled; Nakawa, Makindye, Kawempe and Rubaga divisions.

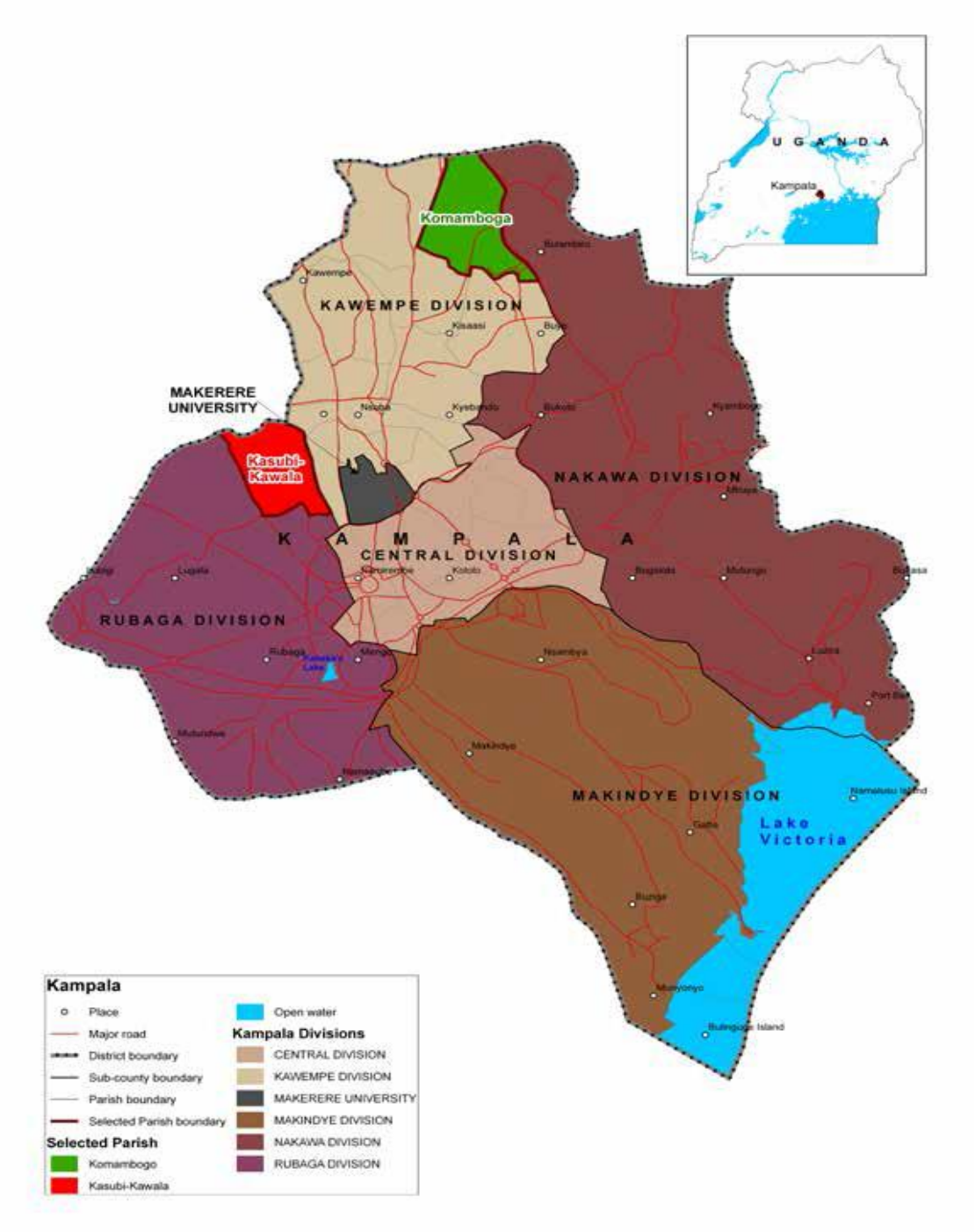

Figure 2: Location of the study area.

Source (Sabiiti *et al.*, 2014)

3.3 Data collection tools and method

Both primary and secondary data were collected for this study. Primary data was collected from respective respondents using the developed semi-structured questionnaires and key informant guides as the tools of data collection. Questionnaires were administered to the respondents (households) and face to face interviews was conducted with the respective key informants using the key informant interview guide tool. Secondary data was collected by reviewing reports, documents and other data materials on urban farming from Kampala Capital City Authority (KCCA) and the Ministry of Agriculture Animal Industries and Fisheries (MAAIF). Below in details is how these tools were used.

3.3.1 Primary data: Survey

The semi-structured questionnaires consisted of 32 closed-ended questions which were administered to the sample of the household selected. According to Wachholz (2017), a closed-ended questionnaire is said to save time, cost, and it is easy to administer and analyse. The questionnaire mainly captured demographic characteristics of the participants, production practices, land access, ownership and marketing. The qualitative research design was used to establish and assess the attitudes of the farmers as their sights on the opportunities, benefits and challenges that come with growing *amaranthus*.

The questionnaire was compiled in English, but interviews were conducted in the local language (Luganda) to eliminate misinterpretation and understanding of the study questions. The researcher and two trained research assistants were responsible for the data collection. The average interview time was about 18 minutes.

Ethical clearance for the study was obtained from the Research Ethical Committee (REC) of Stellenbosch University, clearance number: 10508. Participants were asked to sign the consent forms if they were willing to take part in the study. The consent forms stipulated that participation in the study was entirely voluntary and that participants are free to decline to participate or withdraw from the research study at any time they choose to. The participants were presented with the forms before the interviews, and one copy of the signed consent form was given to the participants

3.3.2 Primary data: Four Key Informant Interviews

Four Key Informant Interviews (KII) were conducted, two staff members of the Kampala Capital City Authority (KCCA) were interviewed the manager of the department of gender community services and production, and a technical officer within the agricultural resource centre in Kyanja; (one statistician in charge of MAAIF secondary data) and one extension worker under wealth and health creation to get detailed and fundamental information on the research objectives. The above category of key informants was chosen because of their verse knowledge on the research topic. The key informants were interviewed using an essential informant guide to gain more insight into the research topics.

3.3.3 Secondary data

Secondary data was also obtained from government sources like KCCA and MAAIF. This was in the form of published journals and magazines. These documents were reviewed, and data on policies and projects done towards urban agriculture and urban farmers in Kampala was collected. This was done to give a general review of policy documents on the status of urban agriculture in Kampala over recent years. First, application letters that were addressed to the Permanent Secretary of the Ministry of Agriculture Animal Industries and Fisheries and director of gender community services and production of KCCA together with a letter of introduction from the university was sent to clear the purpose of the data collection. MAAIF was chosen for the study because of the key role it plays in the overall agricultural sector in Uganda. KCCA, on the other hand, overlooks the Kampala city's activities, both institutions play an essential role in the policymaking of urban agriculture in Kampala and Uganda as a whole.

3.4 Survey population and sample size

Both male and female of all age groups growing *amaranthus* in the selected divisions were recruited for this study if they consented. The unit of this study was a household defined as a group of people living together under the same roof as mentioned in the previous chapter.

A total of 120 urban households were sampled to represent the urban farmers in Kampala. However, out of 120, 82 urban *amaranthus* households were obtained from the four divisions. Since the population of *amaranthus* growers in Kampala was unknown, the sample size was

derived by computing the minimum sample size required for accuracy in estimating proportions. This was done by considering by normal standard deviation set at 95% confidence level, a non-response rate of 0.5 and a confidence interval of 0.05 population of urban farmers but statistically.

The sample size obtained was not equally distributed among the respective four divisions (Kawempe, Makindye, Nakawa and Rubaga), 12.2 percent, 31.7 percent, 28.05 percent and 28.05 percent respectively but rather, the number of households sampled per division depended on the number of *amaranthus* growers that could be allocated from each of the divisions.

3.5 Survey sampling technique

Both random and purposive sampling technique was used in this study. In the first step, four divisions were randomly selected from the pool of 5 divisions. In the second step, *amaranths* growers were purposively sampled from the respective divisions for interviewing. The purposive sampling was implemented through the snowball technique (Patton, 1990), also referred to as accidental sampling, whereby persons are interviewed through chain referral where one respondent provides information on other interview candidates who are also growing *amaranthus*. The first purposively sampled respondent provides multiple referrals to participate in the study. These sampling techniques were used because there is limited data on urban farmers, especially *amaranthus* growers; hence, this is the most suitable methodology to obtain the sample. These farmers were identified with the help of the agricultural extension workers attached to the division and then interviewed. It is also advantageous because it is a non-probability sampling and serves a direct purpose to achieve the set objective of the study.

3.6 Methodological limitations and advantages

The snowball method may create bias because the referrals might have similar traits, thus portraying the similar characteristics of the representative sample since the recruits are only got from the first sample group (Sharma, 2017).

Time constraint was due to the bureaucratic process of obtaining ethical approval. It involved a lot of interaction with the institutions before it is issued thus causing time delays in the field activities of the research study. Both quantitative and qualitative research methodology was employed

during the data collection process; these methods are complementary and enhance the quality of data collected as a wide range of information are obtained (Palinkas *et al.*, 2011, 2015).

Purposive and snowball sampling techniques used was a good fit for this study because it provides better access to the target population for the study since this population mapped out in the respective divisions, save times and cost (Sharma, 2017).

Trained researcher assistants and researcher were involved in the data collection and analysis, and this reduces error margin during data collection as the team are well informed about the study.

3.7 Data analysis

Data analysis was conducted using Stata I/C software version 16. Parameters such as mean, percentages and frequencies were used to summarise descriptive data such as age, sex of respondents and household head, level of education, marital status, social-economic variables and other factors like access to and ownership of land, extension and credit services among others.

The data collected was used to achieve the objective of the study which is to assess the potential of growing *amaranthus* in enhancing household livelihoods.

Analysis of Variance (ANOVA) was used in this study because of its functions. It is used to compare two more population of quantitative data and determines the differences that exist among population means (Keller & Warrack, 2000). So, in this study, the population is the households that grow and don't grow *amaranthus*. Different statistical tests were carried using ANOVA with Least squares means (LS means), F distribution and Chi-square. LS means are predictions from linear models or average thereof (Lenth, 2016). F distribution is used test and estimates the ratio of population variances (Keller & Warrack, 2000). The level of significance or the alpha level used is 5% (0.05), H_0 – Null hypothesis of the entire study is there is no difference between the means of two populations and H_1 – At least the two means differ. The chi-square statistical tests often used for qualitative data to capture the goodness of fit test and statistical independence test (Lenth, 2016). This test can also be interpreted as a comparison of two or more population and also helps researchers to test hypotheses about variables measured at the nominal level (McHugh, 2012). Bivariate analysis was conducted to establish the associations between households that grow and don't grow *amaranthus* and independent categorical variables. Cross-tabulations was done and the

association between households that grow and don't grow *amaranthus* and the categorical independent variables also discussed. The Pearson's Chi-Square test (χ^2) statistic used is of the form;

$$\chi^2 = \sum_{i=1}^{r}\sum_{j=1}^{c}\frac{(O_{ij} - E_{ij})^2}{E_{ij}} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots$$

Where;

r = number of categories of the independent variable

c = number of categories of people's demand

O_{ij} = observed frequency in row i and column j

E_{ij} = expected frequency in row i and column j

With the χ^2 test, the analysis was based on the p-value of 0.05 as the level of significance. The probability of rejecting or accepting the hypothesis was tested. If the p-value is greater than or equal to 0.05, then the statistical relationship between people's demand and the independent variable under study is not significant. On the other hand, if the p-value is found to be less than 0.05, then, there was a significant statistical relationship between the two variables such that if one of them changed, the other would also change.

The data captured the current production structure of *amaranthus*, urban farmers assets and assessed the social-economic conditions of urban farmers, the contribution of *amaranthus* to household livelihoods; challenges faced by urban farmers at the household level. The first phase of the data analysis involved the DFID's Sustainable Livelihoods Approach (SLA) and framework to achieve the three specific objectives i.e. Livelihoods assets, including natural, human, social, physical and financial assets, were captured in the study. Access to extension services, involvement with social groups, livelihood strategies are taken by urban farmers and outcomes of the livelihood strategy were also captured. SLA approach was used in the analysis to explain better how growing *amaranthus* improves household livelihood. The information obtained from SLA was used to compare households that grow *amaranthus* and households that grow other agricultural crops other than *amaranthus*; independently assess the households that produce

amaranthus to have a better understanding of key factors needed, appreciate the diverse factors and process that comprise urban household livelihoods.

The second phrase was supplementary to the first phrase, it involved capturing the opportunity cost; opportunity cost is often used to understand the behaviour of individuals and decision making. Thus, looking at the cost and benefits of taking up *amaranthus* as a livelihood strategy; a measure of its competitiveness (competitive advantage) with other crops and gains from trade; the comparative advantage is defined as the comparison among producers of a good according to their opportunity cost (Mankiw, 1780). Since households are considered decision-makers in this study. It is important to note that during decision making (choice), trade-offs are made due to scarcity of resources hence households play a role in resource allocation. Scarcity here is referred to as limited resources thus unable to satisfy everyone's wants; opportunity cost is defined as the benefit foregone by the particular use of resources. Opportunity cost includes the explicit and implicit cost. Explicit costs include direct costs that require money payment while implicit costs are costs that don't require money payment. Calculating opportunity cost requires comparing the costs and benefits of alternative courses of action i.e. addition of implicit and explicit costs (Mankiw, 1780; Rasmussen, 2011).

In this study, different scenarios were put into consideration to look at independently the production of other agricultural crops (non-*amaranthus* growers) and production of *amaranthus* (*amaranthus* growers) to capture the opportunity cost of producing *amaranthus* and non-*amaranthus*. In the calculation of opportunity cost, various assumptions were made from a simple model was got from (Nugent, 2000) in the calculation of household income from urban farming at the household level. Assumptions applied to both other agricultural crops and *amaranthus* namely; the cost of basic inputs used, yields and prices; inputs used (land and labour), the cost of production, the crop production grown for commercial purpose and returns to other agricultural crops grown and *amaranthus* are fixed cross the urban households. So, data computed included; the income (estimated total revenue) and estimated total cost of *amaranthus* growers and non-*amaranthus* growers from urban farming households. Total cost is defined as the amount that the households pay to buy inputs; in this study, it is referred cost of production. Total revenue is referred to the amount that the households receive for the sale of its output in other words income estimated from the sale of *amaranthus* and other agricultural products; it is expressed as the

quantity of output the household produces times the price at which it sells its output (Mankiw, 1780; Rasmussen, 2011).

Therefore, the opportunity cost of producing other agricultural crops (non-*amaranthus* growers) captured included the addition of explicit costs as the cost of production (total cost) incurred in the production of other agricultural crops and implicit cost as income foregone thus income from producing *amaranthus.* Additionally, the opportunity cost of producing *amaranthus* (*amaranthus* growers) was obtained from the sum of the cost of producing *amaranthus* (explicit cost) and income foregone in producing *amaranthus* thus estimated income (revenue) obtained from other agricultural crops as implicit cost.

3.8 Conclusion.

This chapter aimed to outline the theoretical framework and methods used in the study to assess the potential of *amaranthus* in improving livelihood. Also, statistical tests were considered in the data analysis to bring a comparison between households that grow *amaranthus* and those that don't *amaranthus*. The next chapter provides findings obtained from the sampled urban households that are essential for the research study.

4 Comparing *Amaranthus* growers and non-*Amaranthus* growers

In this chapter, the research study findings were obtained from sampled households growing *amaranthus* (*amaranthus* growers) and households growing other agricultural crops other than *amaranthus* (non-*amaranthus* growers). A comparison was done between *amaranthus* and non–*amaranthus* urban household growers. This was done to bring an understanding of the current structure of crop production and the contribution of *amaranthus* crop production relative to other agricultural crops towards urban households' livelihoods (*amaranthus* and non-*amaranthus* growers). SLA model was used in this study. This model was used to assess the households' resources and assets since they play a role in determining households' ability to pursue different livelihood strategies; agricultural contribution and household income sources. This partly addresses the first and third objectives of the study as outlined in chapter one. Therefore, the categorical variables were captured such as household production sold, relative household income shares, natural capital (size of land, land access and acquisition), access to extension services, financial capital, human capital and crops grown by non-*amaranthus* households.

4.1 Comparing household income

4.1.1 Household production sold

The results from Table 1 show the percentage of household production sold as an indicator for livelihood outcome. *Amaranthus* growing households sold a greater percentage of their household production than those households that don't grow *amaranthus*. This means that households growing *amaranthus* are more likely to have a sellable household surplus agricultural production of 34 percent than households that are not growing *amaranthus*. The remaining percentage of households are likely to keep their production for home consumption. Also, the F statistic had a p-value is less than 0.01, indicating that there is a statistically significant difference between households who do and do not grow the *amaranthus*.

Table 1: Comparing the percentage of household production sold: *Amaranthus* growers vs Non-*Amaranthus* growers

	Level of factor Factor	N	household production sold (Mean)	household production sold (Std.Dev.)	F statistic	P-value
Total		114	60%	33%	7.9516	<0.01
Grow *Amaranthus*	No	39	48%	32%		
Grow *Amaranthus*	Yes	75	66%	31%		

4.1.2 Relative household income as assessed among the farmers.

To capture the diversity in household livelihoods, the importance of which is stressed by Chambers (1995), the relative household income shares of agricultural production, wage earnings, own enterprises (self-employment) and pensions were compared between *amaranthus* growers and non- *amaranthus* growers.

It was found that the urban farmers surveyed derive an average of 55 percent of their household income from agricultural production, with the average being 48 and 58 percent for non-*amaranthus* growers and *amaranthus* growers respectively, see Table 2. However, the P-value is greater than 0.1 and thus it is not clear that there is a statistically significant difference between *amaranthus* growers and non- *amaranthus* growers.

Table 2: Comparing household income from agricultural production: *Amaranthus* growers vs Non-*amaranthus* growers

	Level of Factor	N	Income agriculture Mean	Income agriculture Std.Dev.	F statistic	P-value
Total		101	55%	33%	2.1241	0.15
grow *Amaranthus*	No	33	48%	36%		
grow *Amaranthus*	yes	68	58%	31%		

Turning to household wage income, Kampala urban farmers surveyed indicated that on average they derive 41 percent of household income from wages, see Table 3. Here the difference between *amaranthus* growers and non-*amaranthus* growers is stark with former indicating that they derive 48 percent of their household income from wages and the later 30 percent. In this instance, the P-value is smaller than 0.05 indicating a statistically significant difference between *amaranthus* growers and non-*amaranthus* growers at a greater than 95 percent confidence level. This could

because some households are not entirely dependent on growing *amaranthus* as a sole form of employment and income source thus complementary livelihood. It is believed by authors (Kansiime *et al.*, 2016) that the hindrance of fully taking on *amaranthus* is as a result of the challenges encountered during the production process thus greater share of their household income from wages as a more stable income source.

Table 3: Comparing household income from wages: *Amaranthus* growers vs Non-*amaranthus* growers

	Level of Factor	N	Income wages Mean	Income wages Std.Dev.	F statistic	P-value
Total		47	41%	28%	4.8578	0.03
grow *Amaranthus*	No	19	30%	29%		
grow *Amaranthus*	Yes	28	48%	26%		

The income share from self-employment from the households surveyed was 41 percent with non-*amaranthus* growers showing an average of 44 percent and *amaranthus* growers 39 percent, see Table 4. However, given a P-value of 0.4, the differences between *amaranthus* growers and non-*amaranthus* growers were not statistically significant thus cannot be regarded with confidence.

Table 4: Comparing household income from self-employment: *Amaranthus* growers vs Non-*amaranthus* growers

	Level of Factor	N	Income self-employed Mean	Income self-employed Std.Dev.	F statistic	P-value
Total		67	41%	25%	0.72309	0.40
grow *Amaranthus*	No	27	44%	33%		
grow *Amaranthus*	Yes	40	39%	18%		

Lastly, the household income share from pensions was considered, only 24 percent of the urban farmers surveyed received income in this form which constituted 23 percent of their income on average. This was similar between *amaranthus* growers and non-*amaranthus* growers but the differences were found to be statistically insignificant.

Table 5: Comparing household income from pension: *Amaranthus* growers vs Non-*amaranthus* growers

	Level of Factor	N	Income pension Mean	Income pension Std.Dev.	F statistic	P-value
Total		24	23%	24%	0.0239	0.88
grow *Amaranthus*	No	11	22%	25%		
grow *Amaranthus*	Yes	13	24%	25%		

In the comparison between *amaranthus* growers and non-*amaranthus* households, more agricultural sales are seen from *amaranthus* growers compared to non-*amaranthus* growers. The income sources captured showed that urban farming households attain their income from various sources i.e. agricultural production solely or other means of income (wages, self-employment and pension). According to the findings, Chambers' 1995 theory hold true because they were diverse income sources identified among urban farming households. Therefore, the comparison of households growing *amaranthus* and households that grow other crops showed that a greater percentage of households growing *amaranthus* obtained income from agricultural production than households that grow other crops other than *amaranthus*. It is a significant indicator of the economic role *amaranthus* plays in household livelihoods, the economic details are further discussed in the next chapter. Wages, self-employment were closely followed and pension as the least source of income. *Amaranthus* growing household also had a notable percentage obtaining income from wages compared to non-*amaranthus* growing households. The other sources of income obtain could mean that some urban households are not entirely dependent on urban farming i.e. they are not fully urban time farmers. Overall, in comparison, agricultural production is greater important to *amaranthus* growing than non-*amaranthus* growing urban households.

4.2 Comparing household assets

4.2.1 Natural capital: Land access and acquisition.

Natural capital is believed to be a key component in obtaining a desirable sustainable livelihood outcome. It is said to produce a flow of services that satisfy human needs indirectly or directly (Ekins *et al.*, 2003). Natural capital was assessed in terms of household land ownership, acquisition and land size used for production. Land is an essential resource for agricultural activities, and it plays a fundamental role in determining the overall production outcome (Chambers & Conway, 1991; Morse & McNamara, 2013a; Pedersen *et al.*, 2012; Scoones, 1998; UNISDR, 2010).

The average land size of the 112 farmers surveyed was 1.27 acres (0.514 hectares) with the average land size cleaved between *amaranthus* growers and non-*amaranthus* growers being 1.28 and 1.25 acres (0.518 and 0.506 hectares) respectively, in Table 6. However, the difference between *amaranthus* growers and non-*amaranthus* growers was found to be statistically insignificant concerning the land size.

Table 6: Comparing natural capital, land size: *Amaranthus* growers vs Non-*amaranthus* growers

	Level of Factor	N	size of land Mean (Acre)	size of land Std.Dev.	F-Statistic	P-value
Total		112	1.27	1.15	0.00906	0.92
grow *Amaranthus*	No	35	1.25	1.08		
grow *Amaranthus*	Yes	77	1.28	1.18		

Whilst land size is important, land ownership type is said to be vital because it increases control over other resources as income earned, access to resources needed for agricultural production, for example, capital, credit, infrastructure and inputs (Mtshali, 2002). Five forms of land ownership were observed among survey participants as customary land ownership, freehold, *mailo*, leased-in and other access types such as renting or borrowing (see Chapter 2 under 2.1.4 for the definitions).

With respect to the type of land accessed by *amaranthus* growers and non-*amaranthus* growers, the biggest difference is found between leasehold and other land access types. On average 32.5 percent of *amaranthus* growers accessed their land through leasehold whilst this was only the case for 7.3 percent of non-*amaranthus* growers whereas the inverse is true for other land types (renting & borrowing) whereby 22.5 and 43.9 percent of *amaranthus* growers and non-*amaranthus* growers own their land in this way respectively, Table 7. It is worth noting that the differences between *amaranthus* growers and non-*amaranthus* growers is just above the 90 percent threshold for statistical significance at 0.012 and should thus be interpreted with caution. It was observed that more land at a fair price is easily attained through leasehold and other land types (see Pedersen *et al.*, 2012). Also, *amaranth* plant properties like quick maturing of about 3-4 weeks, ability to be harvested 3-4 times a year and more land allocated to it unlike other crops similarly observed by (Achigan-Dako *et al.*, 2014; Kansiime *et al.*, 2018). Therefore, the above reasons explain the popularity of land access type and the significant difference between *amaranthus* growers and non-*amaranthus* growers. Nonetheless, a possible explanation for differences between leasehold

and other land access types between *amaranthus* growers and non-*amaranthus* growers can possibly be explained by high competition of land and high land prices so some households prefer lease as compared to purchasing land (Sabiiti *et al.*, 2014)

Table 7: Comparing natural capital, land access type: *Amaranthus* growers vs Non-*amaranthus* growers.

Grow *Amaranthus?*	Ownership					Totals
	Freehold	Leasehold	Other	*Mailo*	Customary	
No	10	3	18	2	7	40
Row share	25%	7.5%	45%	4.5%	17.5%	
Yes	19	26	18	3	14	80
Row share	23.75%	32.50%	22.50%	3.75%	17.50%	
Total	30	29	36	5	21	120

Note: Chi-square(df=4) =12.85, p=.01201 Fisher Exact (r x c) p=0.01

Urban households were able to acquire land through other forms. This was done to find out how urban households acquire land to carry out urban agriculture. According to the findings, the higher percent is seen among other forms of land ownership (inherited or received as gifts) among households that don't grow *amaranthus* well as a higher percent is seen among leased-in as a form of land ownership among households that don't grow *amaranthus* in Table 8. Chi-square critical value is 16.88, the degree of freedom is 4 and p-value is 0.0204. the p-value obtained shows that there is a statistical difference between the acquisition of land between households that grow *amaranthus* and those households that don't grow. Acquisition of land and land ownership was looked at, to attain a detailed insight into land ownership; this pattern of land ownership among urban farmers was similarly observed by authors (Prain *et al.*, 2010).

Table 8: Table showing acquisition of land

Grow *Amaranthus*	Land acquisition					Row Totals
	Usufruct right (spouse)	Purchased	Leased-in	others	Inherited or Received as a gift	
O	4	8	2	13	13	40
Row %	10.00%	20.00%	5.00%	32.50%	32.50%	
Yes	3	15	28	15	19	80
Row %	3.75%	18.75%	35.00%	18.75%	23.75%	
Totals	7	23	30	28	32	120

Notes: Chi-square(df=4) =16.88, p=.00204 Fisher Exact (r x c) p=p<0.01

Extension services play a vital role in enabling farmers to apply their assets and resources to achieve their desired agricultural outcome. According to Mtshali (2002), extension services are considered as inputs, thus greater access to extension services should deliver better results for farmers. On average 29.6 percent of *amaranthus* growers had access to extension services whereas 73.8 percent of non-*amaranthus* growers had access to extension services Table 9. Given a P-value close to zero the differences between *amaranthus* growers and non-*amaranthus* growers have a high statistical significance. This could be interpreted that extension officers are paying more attention to the production of other crops other than *amaranthus.*

Table 9: Comparing extension access: *Amaranthus* growers vs Non-*amaranthus* growers

Grow *Amaranthus?*	Access to extension services No	Access to extension services: Yes	Total
No	11	31	42
Row %	26.19%	73.81%	
Yes	57	24	81
Row %	70.37%	29.63%	
Totals	68	55	123

Notes: Chi-square(df=1) =22.39, p=.00000 Fisher Exact p=p<0.01

4.2.2 Financial capital: Access to credit services.

Financial assets are important components of household livelihoods. This was assessed by evaluating whether or not households have access to financial capital in form of income, saving and credit through commercial banks, friends and SACCOs respectively. A total of 77.9 percent of *amaranthus* growers and 58.3 percent of non-*amaranthus* growers did not have access to credit, Table 10. As with financial services the differences between *amaranthus* growers and non-*amaranthus* growers was statistically significant. This indicates underlying issues that come with access to credit to *amaranthus* growers and similar findings were found in a study done by Mwaura *et al.*, (2019), were most vegetable farmers including *amaranthus* had limited access to credit because lack of collateral security as a requirement to receive financial services.

Table 10: Comparing credit access: *Amaranthus* growers vs Non-*amaranthus* growers

Grow *Amaranthus?*	Access to credit? No	Access to credit? Yes	Totals
No	21	15	36
Row %	58.33%	41.67%	
Yes	60	17	77
Row %	77.92%	22.08%	
Totals	81	32	113

Notes: Chi-square(df=1) =4.48, p=.03420 Fisher Exact p=0.04

4.2.3 Human capital: Labour utilised by urban households

Human capital as the skills and knowledge needed to pursue different livelihood strategies to achieve household livelihood objectives (DFID, 1999c). Household labour is said to depend on the household size and skills DFID (1999). The quality and quantity of available labour is a component for achieving sustainable livelihood outcomes (see Bhandari, 2013). Human capital was assessed in this study by establishing whether the respondents had access to labour either through family or hired labour for production. This was captured by asking respondents if they fulfil less than 50 or between 50 and 100 percent of their labour requirements with family labour. On average 80.3 and 82.35 percent of *amaranthus* growers and non-*amaranthus* growers used between 50 and 100 percent of family labour for production, see Table 11. However, whilst it is clear that the urban farmers surveyed mostly make use of family labour for production, the differences between *Amaranthus* growers and non-*amaranthus* growers is not statistically significant.

Table 11: Comparing family labour use: *Amaranthus* growers vs Non-*amaranthus* growers

Grow *Amaranthus?*	family labour proportion 50	family labour proportion 100	Row Totals
No	6	28	34
Row %	17.65%	82.35%	
Yes	13	53	66
Row %	19.70%	80.30%	
Totals	19	81	100

Notes: Chi-square(df=1) =0.06, p=.80361 Fisher Exact p=1.00

4.2.4 Crops grown by non- *amaranthus* growers

Table 12: Crops grown by non- *amaranthus* growers

		Land (acres)		**INPUT**				**OUTPUT**
Crop	Input name	min	max	Input quantity	Input unit name	Price (UGX)	Output unit name	Unit price (UGX)
Bananas	Act force	0.15	1	1	Litre	50000	Bunch	12500
Bananas	Rocket			2		15000		
Beans	fertilizer	0.0573	2	10	Kgs	3000		
beans	Seeds			100	kgs	3500	Kg	2500
Bitter tomatoes	Seeds	0.23	1	100	grams	30000	bundle	2000
Bitter tomatoes	Seeds			1	sack	80000	sack	80000
Carrots	NPK			2	Kg	4000	piece	500
Green paper	Dicephone	0.05	1	2	Kg	12000	sack	80000
Maize	NPK	0.06	2	5	kg	3000	piece (bag)	800(125,000)
Maize	Dap			5	kg	4000		
Maize	fertilizer			2	Kgs	2500		
Maize	fertilizer			2	kgs	2500		
Sukuma wiki	Seeds	0.004		50	grams	25000	bundle	2000
Tomatoes	Seeds	0.011	1	100	grams	550000	kg(boxes)	3,000(300,000)

Notes: Ground-nuts, Carrots, Cassava, eggplants were part of the production though quantity is not defined

Findings show that urban households that are not growing *amaranthus* cultivate staple foods (bananas/plantains) and other foods (maize and beans) and some vegetables (bitter tomatoes, *sukuma wiki*, carrots, green pepper and *Vigna unguiculata*(egobe)) for commercial purpose in the first and second planting season listed in Table 12. It was observed that the crops grown alternate according to seasons, for example, the first season maize is planted then the next season is for beans. Inputs used, input costs and output cost were included in the table. The common inputs used include seeds, land and fertilizers. Land used among non-*amaranthus* growers was expressed in acres, vegetables had less acreage compared to other foods. The quantity sold is in various measurements; sack, bundle, kilograms (kgs), piece and boxes. The sack and boxes command higher prices than pieces and kgs because the output is sold in bulk while the others are retail sales.

The estimated income got from 1st season plantains was 300,000 Ugx; beans was 1,000,000 Ugx; bitter tomatoes (minimum and maximum sale) was 240,000 Ugx and 800,000 Ugx; green pepper was 2,000,000 Ugx; maize was 450,000 Ugx; *sukuma wiki* was 125,000 Ugx; tomatoes (retail and bulk sales) was 90,000 and 4,500,000. The average total revenue sums up to 4,205,000 Ugx. The second season plantains were 400,000 Ugx; maize (minimum and maximum sale) was 100,000 Ugx and 500,000 Ugx; *sukuma wiki* was 125,000 Ugx and 425,000 Ugx; tomatoes were 6,000,000 Ugx and 7,000,000 Ugx. Therefore, the total estimate income (revenue) from households after the first season would 3,855,000 Ugx for retail sales and 8,825,000 Ugx from bulk sales. The second season's total income (revenue) is estimated to be 7,625,000 Ugx from retail sales and 8,825,000 Ugx from bulk sales. The estimated annual income (total annual revenue) would the sum of the first and second season. Lastly, the opportunity cost of producing other agricultural crops would include explicit and implicit cost; the explicit cost (total cost of production) summed up to 784,500 Ugx as shown in Table 12 and implicit cost (retail sales) is obtained from the estimated mean revenue obtained from the first and season 511,323 and 2,162,079 Ugx respectively as shown in Table 17 following chapter under section 5.4.1. Basing on the first and second season, the opportunity cost is the addition of implicit and explicit costs which amounts to 1,295,823 Ugx and 2,946,579 Ugx. Nevertheless, the estimated annual opportunity cost of the first and second season would be different once the assumption for four harvests (vegetable *amaranth*) is taken into consideration and grain *amaranth* annual revenue would be 4,217,795 and 10,820,816 Ugx respectively.

4.3 Conclusion

Amaranthus growing and non- *amaranthus* growing households were compared in this chapter. The results showed that not only does *amaranthus* growing households sell a greater portion of their agricultural production, but they also receive a greater income share from agricultural production, wages and pensions. Also, most *amaranthus* growing households had access to natural capital in form of land with an average land size of 0.518 hectares and leasehold as popular land ownership; low access was observed in obtaining financial capital and extension services. While non-*amaranthus* growing households sell a smaller portion of their agricultural production, even so, they obtain a greater income share from self-employment. Other land types (renting & borrowing) was the commonest form of natural capital with an average of 0.506 hectares

ownership; more access was seen among financial capital and extension services. Human capital was attained through family labour where non-*amaranthus* growers slightly obtained a higher percentage compared to *amaranthus* growers. Overall, the statistical difference between *amaranthus* growers and non-*amaranthus* growers is seen among household production, household income from wages and pension, access to natural capital, credit access and extension services. The crops grown by non-*amaranthus* growing households include staple foods, other foods and vegetables as similarly to other agricultural crops alongside *amaranthus* refer sec.5.2.1.

5 A closer look at *Amaranthus* growers

This chapter solely addresses survey results from *amaranthus* growers. It expands on research findings from the previous chapter to address the three specific objectives of the study as outlined in chapter one. The combination of secondary data obtained from KCCA and MAAIF was included and further analysis was done on household livelihood outcomes of growing *amaranthus*. Three main themes are addressed within the SLA framework as household assets or capital, livelihood strategy, transforming structures and process. Besides, this chapter also considers the opportunities and challenges with growing *amaranthus.*

5.1 Household capital among *amaranthus* growers

According to DFID (1999b), households have access to several forms of capital which they can apply within their household strategy so that they can achieve their household outcome. Capitals are believed to be essential factors in achieving positive household outcomes and also play a key role in enabling households to reduce their vulnerability so that they can better cope with stress and shocks (Chambers & Conway, 1991; DFID, 1999c). Different capitals or assets are employed by household in this process, the SLA framework includes financial, natural, social, physical and human capital.

5.1.1 Financial Capital

In the previous chapter, about 22 percent of households had access to financial capital in form of income, saving and credit as shown in Table 10. This was accessed in formal and informal avenues i.e. formally through commercial banks like Centenary bank, SACCOs like Rona SACCOs, God is Grace Mabuye- Visila and microfinance institutions like Pride microfinance, and informally through credit services from friends. Then, some households can save their income in SACCOs and are also able to access credit via the same avenue. Access to financial capital was essential for households because they can sustain and enhance *amaranthus* growing (their livelihood) and this was observed by (Koster, 2008; Mtshali, 2002).

5.1.2 Human Capital

In the previous chapter, labour was looked at inform of family labour. Here the households growing *amaranthus* labour is considered in detail in the form of working age, family members, family size and gender. Demographic characteristics are crucial according to Bhandari, (2013) since they play a key role in determining the availability of labour available to households for production. This study captured age, household size, the gender of participants, education level, marital status, and gender of the household head across the four divisions sampled.

The results showed that the average age of participants was between 20 to 59 years, with an average of 46, with an average household size of 6 which varied between 5 and 9 between divisions, see Table 13. A higher *amaranthus* growing participation rate was observed for males (54 vs 46 percent). Of most participants, 39 percent, had completed primary school with 33 percent indicating that they had obtained a diploma or university degree. Household heads were predominately male (78 percent), and 68 percent of respondents were married.

Table 13: Demographic characteristics of *amaranthus* growers (n=82)

	Divisions				**Totals**
	Kawempe	Makindye	Nakawa	Rubaga	
General					
Age (mean, Sd)	52 (20)	48 (12)	40 (14)	47 (14)	46 (14)
Household size (mean)	9 (4)	6 (3)	6 (2)	5 (2)	6 (3)
Male, n (%)	4 (33)	20 (68.9)	11 (47.8)	9 (37.5)	44 (53.6)
Female, n (%)	2 (67)	9 (31)	12 (52.1)	15 (65.5)	38 (46.3)
Level of education, n (%)					
No school	0	0	2 (8.6)	2 (8.3)	4 (4.8)
Primary	2 (33.3)	12 (41.3)	9 (39.1)	9 (37.5)	32 (39)
Secondary	0	9 (31.0)	4 (17.4)	6 (25)	19 (23.2)
Diploma and university	4 (66.6)	8 (27.5)	8 (34.7)	7 (29.1)	27 (32.9)
Marital status, n (%)					
Single	1 (16.7)	3 (10.3)	6 (26.0)	3 (12.5)	13 (15.8)
Married	4 (66.7)	21 (72.4)	14 (60.8)	17 (70.8)	56 (68.2)
Divorced	0	2 (6.8)	2 (8.7)	3 (12.5)	7 (8.5)
Widowed	1 (16.7)	3 (10.3)	1(4.35)	1(4.2) _	6 (7.3)
Sex of household head					
Male, n (%)	5 (57.1)	26 (86.6)	15 (65.2)	18 (64.7)	64 (78)
Female, n (%)	1 (42.8)	3 (13.3)	8 (34.7)	6 (35.2)	18 (21.9)

5.1.3 Physical capital: Livestock production

Physical capital was observed in the form of livestock since households typically keep livestock as a store of wealth with few who sell their animals. Less than half of the households growing *amaranthus* (36.7 percent) reared livestock alongside crop production. The livestock kept included cattle, goats, poultry, pigs and rabbits. The captured average number captured from households that rear livestock alongside growing *amaranthus* include poultry as the highest with the number of fifteen, closely followed by nine goats, six rabbits, five pigs and at least number is seen in cattle with three on the average. Also, some of the livestock is associated with products like eggs, milk and meat that serves commercial purposes. However, there are a few numbers of households growing *amaranthus* with livestock which may probably be attributed to land or space constraint faced by most urban farmers in Kampala as previously observed by (Prain *et al*., 2010; Sabiiti *et al.*, 2014).

As shown in Table 14, the average price varied per animal were cattle was the most expensive with rabbits as least priced. The presence of physical asset is said to reduce vulnerability among households because they can sell off the assets into income.

Table 14: Animals reared alongside growing *amaranthus* with their relative prices

Animal type	Average unit price (Uganda shillings)
Cattle	550,000-1,500,000
Goats	150,000-200,000
Pigs	500,000
Poultry	15,000
Rabbits	20,000

5.1.4 Social capital

Social capital gives a sense of belonging and offers a supportive environment to enhance a livelihood strategy. Social capital is also enabling households to access other forms of assets. Previous studies have shown that socialisation has played a fundamental role in enhancing sustainable livelihood and it also builds a network of friends and form getting joy from working

with other farmers (Averbeke, 2007; Bjarklev *et al.*, 2008; Mtshali, 2002; Simiyu & Foeken, 2014).

Social capital was measured in the form of which people belonged to formal groups or networks. It was found that 64.5 percent of *amaranthus* growers did not belong to any social group. Examples of the social groups that respondents were part of include: the Saving and Credit Cooperative Organizations (SACCOs); religious organizations such as Caritas Uganda, St Agnes women Catholic group and the Tabliq Fraternity; farming groups like the Great Agri-business and Network Farming Uganda, Farming Uganda, Nakawa United community group, BASAM (Business administration Association of MUBs), the Walumu Development Association, Team progress, Twezimbe women group, Kezimbira women's group, the Mirembe group; and lastly tribal groups like Basoga Nseete. Some respondents were also part of income-generating social groups such as the *Boda Boda* motorbike group.

5.2 Livelihood strategy: *amaranthus* growing

To understand growing *amaranthus* as a livelihood strategy, the production process was considered in terms of farmers' experience with growing the crop, the method of production and the inputs used.

5.2.1 *Amaranthus* experience and alternative crops

Most households (46.8 percent) have been growing the crop for five years or more with 36.7 percent indicating that they have grown the crop for between 2-4 years. In addition to growing *amaranthus*, households indicated that they grow leafy vegetables and grains. Crops typically grown include maize, tomatoes, beans, bananas (matooke), bitter tomatoes and *sukuma wiki*. Examples of lesser grown crops include onions, green pepper and eggplants. The findings showed that the commonest crop grown alongside *amaranthus* was maize at 24 percent, closely followed by tomatoes (22.78 percent) and bananas (14 percent). This is an indication that urban households engage in growing a wide range of crops and take up different livelihood strategies and are likely to reduce vulnerability.

5.2.2 Production method

The findings showed that direct land sowing outside of the homestead was the most prevalent (66.3 percent) production method used to grow *amaranthus* followed by backyard planting or kitchen gardens (22 percent), intensive cultivation (5.8 percent) and recycled plastic (4.6 percent). The extent of broadcast direct sowing is limited by available land. The use of recycled bottles is said to be ideal for areas with limited access to land thereby still realising the household and health benefits of the crop (Orsini *et al.*, 2013).

Most households (91.5 percent) reported that they did not use inorganic fertilizers with most (60 percent) indicating that they prefer organic fertiliser in the form of cow and poultry manure. Table 15 provides a cost comparison between the inputs used to produce *amaranthus* and other prevalent local crops. The inputs used by *amaranthus* growers had various corresponding prices with several quantities of *amaranthus* seeds at 50 grams at price ranging from 20,000-25000 Ugx, fertilizer (10 kgs) at 1000 Ugx, fungicides (t-buzz) of 100mls at 30,000 Ugx) and Organic fertilizers of chicken dropping (a sack at 10,000 Ugx) and cow manure (100 kgs at 90,000 Ugx). Input cost (cost of production) used to produce *amaranthus* sum up to 153,500 Ugx. The input quantities captured cut across *amaranthus* and other crops grown alongside, they were in form of grams, kilograms, mls, sticks, vines and a bag or sack. A bag is estimated to be 50 kilograms. Overall Table 15, gives an estimate of some necessary inputs used, the costs incurred by an *amaranthus* farmer and the production of other crops grown alongside as listed below.

Table 15: Inputs used by *amaranthus* growers.

Crop	Inputs	Measurements	Prices (UGX)
Amaranthus	Seeds	50 grams	20000-25000
Amaranthus	Fertilizer	10kgs	1000
Amaranthus	Chicken manure	Sack	10000
Amaranthus	t-buzz (Fungicide)	100mls	30000
Amaranthus	Cow manure	100kgs	90000
Banana	NPK 17:17	15 kg	3000
Beans	Dap	5 KG	3000
Beans	Seeds	2 kgs	3000
Beans	Fertilizer	5Kgs	3000
Bitter Tomatoes	Seeds	50grams	20000
Cabbages	Seeds	50 grams	10000
Cassava	Sticks	100 sticks	1000
g-nuts	g-nuts seedlings	1 bag	14000

Green paper	martial sticker	5ml	40000
Maize	Seeds	3 kgs	3000
Maize	Fertilizer	3kg	10000
Onions	Seeds	5kgs	10000
Sukuma wiki	Seeds	50 grams	20000-25000
sweet potatoes	sweet potatoes vines	Vines	4000
Tomatoes	t-buzz	100mls	30000
Tomatoes	Easy grow starter	Ml	40000
Tomatoes	Seeds	5kg	10000

A total of 29.63 percent of *amaranthus* growing households had access to extension services rendered by several entities which included Agriculture for Health and Wealth Creation, The Great Agri-business and Network Farming- Uganda and Caritas Uganda. According to Mtshali (2002), extension services are linked to increased food production and transforming economies due to the availed information which is essential to livelihood security and achieving a desirable outcome. Thus, the issue of extension services warrants further attention in a future study since greater access to the extension services could improve the productivity of *amaranthus* growing households.

5.3 Transforming structures and process

Institutions and markets are part of transforming structures within the SLA framework. The contribution of transforming structures to establishing sustainable livelihoods is to put in place policies and governing institutions that enhance or limit the capabilities of the households to take up a livelihood activity. Two transforming structures were assessed with this study as the. Ministry of Agriculture, Animal Industry and Fisheries (MAAIF) and Kampala Capital City Authority (KCCA). MAAIF is the overarching governmental agricultural institution in Uganda that play a key role in the agricultural production policies in the country and thus was important to consider in this study. Whilst not directly involved with urban agriculture, MAAIF provides agricultural grants to KCCA which are used to support urban agriculture activities. KCCA has been involved in urban agriculture since the enactment of the relevant ordinances in 2006 and has since been actively promoting urban agriculture through various projects. Examples include establishing an agricultural resource centre to train urban farmers, promoting the use of improved agrarian technologies and drives dissemination of high productivity crop varieties such as seedling distribution schemes through its extension network (KCCA, 2013, 2018). It also provides

production grants, distributes market information and promotes a saving culture through Savings and Credit Co-operative Societies (SACCOs).

KCCA is currently working on many projects, especially to do with mushroom growing and leafy vegetables among the youth to create livelihood and employment. Now we offer extension services, seedings and SACCOS at every division. We hope to achieve this by putting up a resource centre that can encourage and train various urban farmers. We are advocating for value addition to target export markets like Rwanda, Kenya and other East African countries at large (Mr Kirya KCCA manager, 1st October 2019).

Concerning transforming structures and process, this study found that having access to markets to sell their produce is a major challenge to *amaranthus* growers. There were four marketing strategies used as retail markets, contract markets, roadside, small stalls and on-farm sales. As showed in Table 16, the majority of urban households sold their *amaranthus* (leaves, seeds and processed products) at retail markets and small stalls. The lowest percentage of sales were observed through contract selling across all the three product types. When asked about the challenges with growing *amaranthus* 16.95 percent indicated that having access to a dependable market for the crop is a major challenge.

Table 16: Table showing selling mode for *amaranthus*

Amaranthus	**leaves**	**Seeds**	**Processed products**
Marketing strategy	Percentage of household		
Contract selling	1.27	0	1.3
Retail market	50.63	48.72	42.8
Roadside	1.266	1.3	5.19
Small stalls	27.84	26.92	24.68
Farm sales	18.99	23.08	25.9

5.4 Livelihood Outcome

Livelihood outcomes were captured in various ways; crops sold together as price and quantity, the contribution of growing *amaranthus* to households' livelihoods i.e. reasons and benefits. Then opportunities and improvement were captured to find out the underlying potential of growing *amaranthus.*

5.4.1 Livelihood Output

82.5 percent of the household took up vegetable *amaranth.* Most grown vegetable amaranthus species identified were; *amaranthus dubius* and *amaranthus lividus.* The unit of measure for leafy vegetables such as *amaranthus* are in bundles. The leaves are tied in a bundle of about twelve to fifteen leaves, and these command different market prices depending on the market location which impacted by the characteristics and number of the people surrounding the market. The production of the *amaranthus* takes place during two seasons with the crop of the first season typically harvested in May and the second in November.

Table 17 *Amaranthus* output

Units	MEAN	SD	MIN	MAX
Bundles 1st season	278.9545	344.3161	110	1500
Bundles 2nd season	1085.926	2589.23	50	10000
Income bundles 1st season	511323.7		201630	2749500
Income bundles 2nd season	2162079		99550	19910000
Bags income 1st season	440000		80000	800000
Bags income 2nd season	1100000		1000000	1200000
Income shares (household)				
Household production sold	63.82%	31.31%	0.00%	100.00%

Considering the previous chapter, section 4.2.4, the opportunity cost incurred is the income obtained from the sale of vegetable *amaranthus.* Thou it is important to note that grain *amaranthus* was equally produced. During the first season, households sold the minimum was 110, the maximum was 1500 bundles and an average of 279 bundles. and second season minimum was 50, maximum 10,000 bundles and an average of 1085 bundles of *amaranthus*, generating average income (total revenue) of 511,323 and 2,162,079 Ugx given an average market price of 1,833 and 1,999 Ugandan shillings per bundle during the respective seasons as indicated in Table 17. Households that produced in bulk had on the average 440,000 and 1,100,000 Ugx in the first and second season. It is estimated these *amaranthus* sales represented an average of 63.82 percent of household income. The increased production during the second season is on the account of higher rainfall, fetching higher prices and more sales. Bulk sales in sack quantity commanded different prices of 40,000 Uganda shilling and 50,000 in the first and second season respectively. Here the opportunity cost included implicit and explicit; the implicit cost includes foregone income (revenue) obtained from producing other agricultural crops (non-*amaranthus* growers), estimated

average income (revenue) was 4,205,000 Ugx from section 4.2.4. The explicit cost was the cost of production of producing *amaranthus* is 153,500 Ugx. The average opportunity cost obtained 4,358,500 Ugx.

The estimated income generated from 4 circles of harvest on the average is projected (bundles) annually for 1st and 2nd season would be 2,045,295 (511323*4) and 8,648,316 (2162079*4) Ugx. However, it has also shown once there is more productivity, more income is got and estimated to be 79,640,000 (19910000*4) Ugx. In bulky (bags) projected income got annually for 1st season and 2nd season would be estimated to be 19,360,000 (4840000*4) Ugx and 96,800,000 (24200000*4) Ugx.

Results obtained also showed households about 17.5 percent of the households took up grain *amaranth*. The average price of grain *amaranth* was 1458 Ugx per kilogram; the average quantity produced was 476 kgs. The income from only growing grain *amaranthus* would be 694,000 Ugx after one circle of harvest. Since grain *amaranthus* takes 8-12 weeks, the estimated returns for two circles of the harvest is 1,388,000 Ugx. Therefore, households that grow *amaranthus* (vegetable and grain *amaranth*) receive more returns.

Regarding section 5.2.1, the commonest crop grown alongside *amaranthus* was maize at 24 percent. In the comparison of maize and *amaranthus*, maize was grown on the average 1.015 acres of land (0.410 hectares); bulk output on the average of 30 bags and retail output of 2625.5 Kg on the average. The maize output price varied among households; per piece was at 600 Ugx 2000 per kg and 10,000-20,000 Ugx per bag. The estimated value of output from one season would be 5,251,000 Ugx (2625.5*2000) and 600,000 Ugx (20,000*30). While *amaranthus* land acreage on the average was 0.428 acres (0.173 hectares), also the findings show that the crop is grown in small spaces i.e. intensive farming like backyards, the numerous circles of harvest (four) because of it's quick to mature and more income is obtained after a short period; lastly grain *amaranth* is said to be more nutritious than maize (see Esan et al., 2018). Therefore, the benefits of *amaranth* over maize are not only economical (cost-effective and more income) but there are nutritional benefits; grain *amaranthus* can also be considered as an alternative crop since it's cost-effective and it has lysine than maize essential for proper growth.

5.4.2 Contribution of *amaranthus* to household livelihoods

Here non-numerical data was collected from structured questions to capture the urban households' responses to *amaranthus*' benefits, reasons for production, opportunities and what are suggested ways of improving their production. Therefore, the assessment of the contribution of growing *amaranthus* to households' livelihoods was done by capturing the reasons for and benefits of producing *amaranthus,* as well as opportunities for improvement of the production of the crop was done as listed below.

5.4.2.1 Reasons and benefits for growing amaranthus

According to the results, urban households engage in growing *amaranthus* for home consumption, reducing food expenditure and to obtain extra income used to meet household needs such as paying for school fees, medical expenses and to improve household resilience in harsh conditions. The production of *amaranthus* also acts as a source of employment for some in Kampala. In total 54.3 of respondents indicated that they grow *amaranthus* for income generation and 45.7 percent indicated that it is grown for consumption.

5.4.2.2 Challenges with growing amaranthus

Several challenges were listed by the urban households who grow *amaranthus* this includes damage to the crop by the domestic animals of neighbours and birds, inconsistent yields due to adverse weather conditions such as drought, lack of capital to purchase additional, high costs to control pests and diseases, access to land, poor quality seeds and market access. However, four major challenges emerged pest and diseases as the biggest challenge with 52.54 percent of households affected and have also similarly been observed by (Abang *et al.*, 2014; Muyonga. *et al.*, 2010), particularly pests like caterpillars. Then inconsistent production followed closely with 23.73 percent, no market at 16.95 and lastly livestock damage at 6.78 percent challenging *amaranthus* growers.

Another challenge cited by respondents is the preservation of *amaranthus* given its perishable nature and thus producers need to improve preservation techniques, this has also been highlighted by (Kansiime *et al.*, 2016). Some farmers also indicated that they face a negative perception of *amaranthus* since it is seen as a weed. This perception is also to be found among *amaranthus* growers with 3.6 percent indicating that *amaranthus* as a wild plant. Similar sentiments have also

been raised by key informants in a study conducted at Kyanja Resource Centre and Agriculture for health and wealth:

> *Amaranthus as a crop is considered a wild plant because of its weed nature. The plant has the ability to spread its seeds from the tip to the soil, and because of that, it can re-germinate itself even though the land has been cleared. The crop has not been greatly advocated because of its common nature to grow among various crops, and most people don't find the need to grow it or purchase the crops and seedlings (Arinatwe Obsert, Kafuma Joseph, October 2019).*

Changing the perception of *amaranthus* growers is a key challenge to *amaranthus* attaining its potential.

5.4.2.3 Opportunities with growing amaranthus

Several advantages of the crop were listed, this includes: the fact that the crop is quick to mature and the production persists for months, the production of the crop does not require a lot of rainfall and labour, the production thereof and there is a growing demand because of an expanding urban population and increasing awareness of the health benefits of the crop. However, the outstanding opportunities with growing *amaranthus* that were listed included good market for *amaranthus* at 64.58 percent as the biggest opportunity identified, then good yields at 18.75 percent as the second opportunity and lastly, easy to grow at 16.67 percent. Producers have also indicated that preservation methods such as drying and powdering, increases the shelf life of the product. According to Onyango (2010), vegetable *amaranth* was traditionally preserved in different ways, i.e. sun-drying and fermentation and *amaranth* were boiled for a limited time then after it is sun-dried. Overall, Uganda is an agricultural country that allows agricultural crops to thrive because of its good climatic condition, soil and demand for organic fresh foods like *amaranthus*.

5.4.2.4 Improvement of production of amaranthus

In response to strategies for the improvement of *amaranthus* production, the participants mentioned the following: need to increase access to land to favour large scale and commercial production as land currently available is inadequate, increased access to credit facilities such as agricultural loans, access to agricultural extension services such as training on agronomic practices, increase access to agricultural inputs such as irrigation systems, provide access to good quality seeds, fertilizers, pesticides among others to favour production. More training to farmers on the preservation of *amaranthus* and local processing to increase utilisation.

5.5 Conclusion

A closer look at *amaranthus* growers was focused on in this chapter. *Amaranthus* growers had access to various capitals thou less access was identified among financial, social capital and extension services. *Amaranthus* growing as a livelihood strategy was taken on by most household for five years with less input use thou organic fertilizers was mostly consumed; However, *amaranthus* was taken up as a complementary livelihood strategy along with other diverse sources of income. KCCA was identified as an important transforming structure in urban agriculture and also most *amaranthus* growing households had less access to markets. The major challenge observed was pest and diseases, despite that overall findings showed household could attain livelihoods outcomes like more income, well-being, reduced vulnerability and improved food and nutritional security.

6 Summary, discussion and conclusion

The objective of this research study was to assess the potential of *amaranthus* growing in enhancing urban household livelihood among urban farmers in Kampala. This chapter looks at the conclusion and some recommendations.

The overall objective of the study was to assess the potential of growing *amaranthus* in enhancing urban household livelihoods in Kampala by using the SLA. In the bid to try to improve or enhance a livelihood, there must be an understanding of what is needed which involves the appreciation of the diverse factors and process that comprise livelihoods (Morse & McNamara, 2013b). DFID's SLA was used in the study to understand the factors that affect people's livelihoods and eliminate poverty among the urban poor as a strategy to know how growing *amaranthus* can improve household livelihoods. As mentioned earlier, DFID's SLA has different elements, namely; vulnerability context, livelihoods assets, transforming structures and process, livelihood strategies and livelihoods outcomes.

6.1 Summary: Comparing *amaranthus* growers and non-*amaranthus* growers

Overall findings show that *amaranthus* can be a good contributor to household livelihoods in Kampala. There is a significant difference between *amaranthus* growing households and non-growing households particularly among; household production, household income from wages and pension, access to natural capital, credit access and extension services. Households growing *amaranthus* obtained more income shares and sales from agricultural production than households that grow other crops other than *amaranthus*. This means the household growing *amaranthus* are more likely to obtain income from *amaranthus,* unlike households that grow other agricultural crops except for *amaranthus*. Diverse income sources also captured more income obtained from other income sources like wages and pension. This shows consistency in urban studies were households obtain more income from non-farming activities (see Prain *et al*., 2010). Also, non-*amaranthus* growing households have more access to credit and extension services which would probably be attributed to the presence of collateral security and more regard of other crop varieties as compared to *amaranthus* in obtaining extension services.

The comparison between *amaranthus* and non-*amaranthus* growing households was further looked at in terms of the crops grown and opportunity cost. Opportunity cost here was considered because of the scarcity of resources which has a direct influence on decision made by households and have a better understanding of factors that influence decision making thus taking up a particular livelihood strategy (*amaranthus*). The overall opportunity cost was obtained in consideration of households growing other agricultural crops (non-*amaranthus* growers) and households growing *amaranthus.* The opportunity cost of producing other crops which in this context it would be foregoing the benefits of producing *amaranthus* and vice versa. Benefit foregone was in monetary terms and non-monetary terms (implicit and explicit cost). The findings showed *amaranthus'* annual opportunity cost is lower as compared to the production of other agricultural crops; it can mean that households could gain more in the cooperating *amaranthus* as a livelihood strategy and improve their livelihoods; also shows if they (urban households) decided to specialise on growing *amaranthus*, they would have more gains or sustainable outcomes. This also means the urban farmers are better off producing *amaranthus* to other crops because households growing *amaranthus* give up less of producing other crops that's having a comparative advantage over households growing other crops.

Other findings also showed the involvement of urban households in non-farming activities were various sources from wages, self-employment and pension; this indicated a significant number of households obtain income from wages and self-employment and also a relatively good percentage getting their income from agricultural production. Basing on these findings, this could mean that agricultural activities play a complementary role in household income status and at the same time, this could imply the urban households taking up UA particularly *amaranthus* would also a platform for employment from agricultural activities. Thus looking forward to UA as a means of eradicating poverty among the urban poor but also improving their wellbeing as stated by (Orsini *et al.*, 2013).

The findings in the study similarly observed that the crops grown by non-*amaranthus* and non-*amaranthus* households for sale are similar as shown in chapter 4 and 5 i.e. leaf vegetables, grains and staples foods; plantain, maize, tomatoes, beans and *sukuma wiki*, onions, green pepper and eggplants.

6.2 Summary: Livelihood outcomes

The overall objective of the study was to assess the potential of growing *amaranthus* in enhancing urban household livelihoods in Kampala by using the SLA.

6.2.1 Assessing asset usage

One: Accessing the assets used in the current production structure of *amaranthus* among urban households particularly *amaranthus* growing households

Here the assets obtained were; natural, social, economic, physical and human capital. According to the findings, a good indication of urban households have access to different capitals however there is a difference was observed in access to these capitals among *amaranthus* growing households. Households' access to natural capital was measured through the size of land, land ownership and acquisition of land. Overall observation showed a significant number of households have access to natural capital, but limitations like land size and land use rights were obtained. Urban households growing *amaranthus* had significantly small pieces of land occupied and leasehold form of land ownership as the majority of land ownership forms observed. The relatively small acreage use and the reference of hiring land as compared to owning land is probably attributed to the competitive land use that has hike prices of the land in Kampala. This shows that the issue of land may not be a constraint towards urban farmers growing *amaranthu*s. Altogether, the presence of natural capital, especially land resources, is very fundamental for agricultural activities like *amaranthus* growing and the enhancement of agricultural livelihoods but there is limited access to extension and financial capital especially among urban household growing *amaranthus.*

However, most households had no access to social, financial and physical capital while other households had more assess to natural and human labour. Although human capital was accessed, most households preferred to use family labour. It was observed more male-headed households and younger group participating in *amaranthus* growing. Additionally, the findings showed the age group 20-59 years with average age 46, it is also an indicator that the producers fall in the

active age and are capable of fully participating in physical activities in *amaranthus* production; It is believed that the young and middle-aged groups are better at making effective decisions thus proper utilisation of resources. Also, results showed a good percentage of households have an education background; people with a form of education are believed to be inclined to process information better, create new ideas and inventions, appreciate new technologies toward *amaranthus* crop production (Ainebyona *et al.*, 2012; Shu'aibu *et al.*, 2017). A relative percentage of households have long years of experience of growing *amaranthus* (46.8 percent) as indicated in the previous chapter, this also a good indicator of quality labour where *amaranthus* producers have attained relevant managerial skills over years of crop production. All the above demographic characteristics are good indicators of the quality and quantity of available labour is a component for achieving sustainable livelihood outcomes (see Bhandari, 2013). Overall, various studies have shown that the presence or absence of access to capital increases or reduce the vulnerability of household livelihoods (Chambers & Conway, 1991; Koster, 2008; Mtshali, 2002; Petersen & Michelle, 2010; Scoones, 1998).

Households showed that there are diverse sources of income thus they take on different livelihood strategies complementary to *amaranthus* growing thus relative household income shares; this clearly showed a diversity of sources of income which is in line with Chambers (1995) study. In the observation, some urban households took on other livelihood strategies in form of different crop varieties also from diverse sources of incomes. However, looking at income sources is necessary; it is equally important to understand growing *amaranthus* as a livelihood strategy. Therefore, the production process was looked at namely; the duration of time the farmers have been engaged, the method of production and the inputs were captured. The highest duration of time *amaranthus* growing households was five years and above. Most of the households planted directly on land and some households are adopting intensive farming methods. This is also an indicator of some households incurring fixed costs on land and other incurring variable cost as a result of renting the land as shown in Table 7. The unpopularity of the intensive form of growing *amaranthus* would also be attributed to rudimentary technology, lack of capital and limited information or knowledge on the use of modern techniques like utilising small spaces or adopting the innovative cropping system similarly observed in (Kansiime *et al.*, 2018). For this reason, it would be advisable to adopt this form of growing *amaranthus*, especially among household that has limited space for cultivation (Ochieng *et al.*, 2019). During the production process, different

inputs were identified seeds, organic fertilisers fungicides, organic fertilizers (chicken droppings and cow manure), labour and extension services. The inputs used was cost-effective and minimally applied in growing *amaranthus*. However, most households had no access to extension services which may hinder relevant information for effective *amaranthus* production. Over-all conclusion, *amaranthus* production process showed the availability of the essential capital needed and attribute to *amaranthus* production for thus natural, human and financial capital. Now, looking closely at the *amaranthus* production process; it was cost-effective and affordable. The inputs are used are minimal for example the average land is used for production was relatively small, the labour used was mostly family labour and the other inputs were relative at low cost and mostly organic/environmentally friendly. The findings also showed the *amaranthus* can be grown under intensive farming and can grow in small spaces, this means one doesn't require a lot to start and maintain the *amaranthus* crop production. However, some of the costs of using rudimentary technology like broadcasting planting methods have limited the use of intensive farming practices; also the rudimentary technology putting more pressure on urban farmers to look for bigger land sizes which would mean high production costs on leased land rather than practising intensive farming on owned land with no rent costs.

6.2.2 Assessing transforming structures and processes

Two: Accessing the transforming structures and processes (role of institutions and markets) in urban agriculture particularly *amaranthus* growing households.

Transforming structures like institutions and market were assessed through the presence of markets and the two important institutions that play a role in urban agriculture i.e. KCCA and MAAIF. In conclusion, different markets are identified, and they varied according to the location of the household in Kampala. These markets assessed by *amaranthus* growing households were Ggaba, Nakasero and Nakawa market. Also, retail market, contract market, roadside, small stalls and other forms of markets were assessed. Von Thunen's model explained the close proximity or distance of the markets to meet the demand of existing consumers in urban areas (Kampala) were urban farmers produce to meet the demand of the nearest market (Robert Sinclair, 1967). KCCA was

recognised as one of the leading institutions in structuring urban agriculture in Kampala. KCCA structured ordinances which were drafted in 2006 about thirteen years ago and still in place (KCCA, 2006). The ordinances that were put in place to guide and regulate UA. Currently, KCCA plays a fundamental role in urban agriculture through the training of urban farmers, promoting improved agrarian technologies and high crop varieties through the set agricultural resources (KCCA, 2018). In addition to that, KCCA also offers essential services seedlings (input provision), grants, supports saving culture through SACCOs, market information, technology development and offering extension services to urban farmers. In conclusion, in recent years, there is more involvement of the public sector in urban agriculture that creating a conducive environment for urban agriculture to be taken up as a sustainable livelihood.

6.2.3 Assessing livelihood outcomes

Three: Accessing the livelihood outcomes through the contribution of growing *amaranthus* from urban households

In the bid to assess the livelihood outcomes obtained from urban households. Here livelihood outcome was assessed in two ways; household production and contribution (urban household's response to the benefits, reasons for production, opportunities and what are suggested ways of improving their production); the participation of the urban households was considered thus capturing their response. Also, SLA advocates participation to understand the household livelihoods. According to Petersen and Michelle (2010), participation is fundamental in the planning of development activities because of the inclusion of the poor, and it also gives an understanding of poverty, this will bring clarity on their priorities and perception of livelihoods that are undertaken. In addition to that wellbeing of urban households growing *amaranthus* is assessed; to analyse and express what the poor know, need and want (see Chambers, 1995).

Household production from urban households growing *amaranthus* was quantified in different ways namely; the percentage of household production sold and the crops sold had various and unique units of measurement. A greater percentage of household production sold captured; this showed that *amaranthus* production to households serves both for sale purpose and own consumption, However, more household cultivate the crop for purposes of sale. This is a good indicator that agriculture plays a vital role among households especially towards food consumption

and income; also, households stand to gain more economic and nutrition benefits from the sale of amaranthus and own consumption thus it is more likely to be a sustainable livelihood strategy once it is taken up. The crops were sold in different measurement (quantification); *amaranthus* was sold in bundles and the income obtained varied from the first and second season, with more income and production got from the second season. Also, since *amaranthus* production can be grown in more than two seasons up to four circles of harvest, more estimated income is likely to be earned. Therefore, more income and wellbeing are livelihood outcomes got from urban households growing *amaranthus*.

The contributions of *amaranthus* in this research study were evaluated fourfold. The first fold is the reasons why households engage in *amaranthus* growing. Twofold was the benefits for growing *amaranthus*, threefold was opportunities and challenges, and fourfold was how urban households could improve the production of *amaranthus*. It has been observed that households grow *amaranthus* for various reasons. However, the outstanding reasons and benefit were mainly two; for own consumption and income generation. Most urban households prefer growing the crop for home consumption for different reasons like reducing expenditure on purchasing food and supplementation of the household diet; this was similarly seen in a study by Grubben & Denton, (2004), where most households consume *amaranthus* as a sauce or a side to complement the main dish that is usually starchy and also in early literature reports the similar reasons why households engage in urban agriculture (Maxwell, 1995; Musiimenta, 2002; Drescher *et al.*, 2006).

Medical and health reasons were among the reasons why households were engaging in this livelihood since *amaranthus* has got vitamins, iron, zinc and microelements of proteins, different household consume *amaranthus* to correct deficiency especially among the nursing mothers and young children and it is seen in (Achigan-Dako *et al.*, 2014). *Amaranthus* is a crop that has got a significant number of vitamins that are essential for the human body, with the integration of this crop in the urban diet. Households are likely to be food secure with more consumption of recommended calories intake; with reference to the findings, a minimum percentage was 0 percent of the sold agricultural produce, this is an indicator that some household grow *amaranthus* solely for home consumption. Also, based on the response obtained from an older age group growing *amaranthus*, they expressed their interest in taking up the crop for its' health benefits. A similar observation was made (Ainebyona *et al.*, 2012) were an older group preferred growing grain

amaranth for health benefits. This shows that well-being and improved food and nutritional security (dietary intake food security) is obtained from households as livelihood outcomes.

Other households preferred growing *amaranthus* because of plant-related reasons like the ability to withstand harsh conditions, high resistance to pest and diseases and favourable weather conditions other farmers prefer growing on a small scale and the ability to grow on agricultural marginal lands similarly as observed by (Kansiime *et al.*, 2018); while some farmers prefer this crop because it does not need a lot of attention during the production because of *amaranthus*' ability to stand harsh condition. A similar observation was by authors and studies AVRDC, 2008; Shukla & Rastogi (2013); were *amaranthus* is said to withstand harsh climatic conditions such as drought, and its resistance to pests and low cost of production because of less use of fertilizers and attention compared to other vegetable crops**.**

Lastly, the extra reason given by household growing *amaranthus* for engaging in the crop's production was the need to satisfy growing a mixed variety of crops; some urban farmers prefer to cultivate different crops to capture different demand for other food crops like starch and grain crops.

Nevertheless, according to the findings *amaranthus* as a crop faces different challenges like pest and diseases, inconsistent production, no or low market, livestock damage, the negative perspectives towards growing *amaranthus* where it is considered a wild plant, as well as the perishability of the crop, limited knowledge and market information on the value-added products like porridge, an ingredient in baking products like cookies that would be obtained from growing *amaranthus* grain. And yet *amaranthus* has got opportunities like good market and yields and easy to grow so once the farmers can take advantage of the above opportunities, they will be able to target value addition suppliers like Nutreal Limited Uganda for export markets. Nutreal Limited Uganda is a limited liability company that processes snacks, i.e. *amaranthus* cookies, cereal bars and flour from grain *amaranthus.*

In conclusion, regardless of the challenges seen with growing *amaranthus.* Based on the findings, urban households growing *amaranthus* identified; livelihood outcomes like wellbeing, more sustainable use of land (make use of small spaces), more income, reduced vulnerability and improved food and nutritional security (dietary intake food security) from taking up *amaranthus* as livelihood strategy.

6.3 The potential of *amaranthus* to improve urban livelihoods

This section discusses the potential of *amaranthus* in improving urban livelihoods as the economic, employment and social impact potentials.

6.3.1 Economic potential

Amaranthus has moderate economic potential since it's a seasonal product with nutritional and health benefits and there is a growing demand for the crop. Since *Amaranthus* (vegetables) takes about four weeks to mature, farmers can harvest in 4 circles (short growing cycle); therefore, income is easily obtained after a short period. There is potential for a high yield of *amaranthus* in the good season thus good produce fetching more income—demand related reasons like taking advantage of the rise in demand during the festive seasons. As the festive season draws closer, households demand more vegetables to complement their diet. Therefore, some households take up that opportunity to capture the season's demand.

Most households solely engaged in growing *amaranthus* for selling purposes to generate income. This implies that there is future potential for income generation in a*maranthus* growing since it has all year production and it can be a sustainable livelihood to be taken up by urban households. This also shows that households that focus on selling rather than consumption are likely to get more income and attract other households to engage in commercial *amaranthus* farming. Thus, achieving the over goal of more income and having better sustainable livelihoods.

As noted earlier, 45.7 percent of households acknowledged growing *amaranthus* for their own consumption. Since *amaranth* plant is known for its' quick maturing period of about 3-4 weeks, ability to be harvested 3-4 times a year (Kansiime *et al.*, 2018); the short growing cycle as an advantage of a guarantee all year food production. The availability and quality of food; are said to be a good indicator of food security(Andeyhun, 2014), based on the nutritional value of *amaranthus;* this implies nutritional consumption requirements are met and the short time harvest gives households to have a relatively adequate supply of food; the potential to curb down malnutrition and food and nutritional insecurity among urban households. Basing on (Achigan-Dako *et al.*, 2014; Esan *et al.*, 2018), the nutritional value of *amaranth* is said to have a high protein value where the grain *amaranthus* showed higher protein compared to maize while vegetable *amaranthus* has micronutrients that are not only essential but they provide an affordable platform

of acquiring the required dietary intake. Through the dietary diversification since *amaranthus* is also known for playing a role in fulfilling micro and macronutrients and protein requirements (Sulaiman & Andini, 2016). A similar observation was made by (Ochieng *et al.*, 2019), were the increased production and consumption of leafy vegetables like vegetable *amaranthus* can make an important contribution to improved nutrition.

The extra income obtained is used by households to venture into other livelihood strategies or to better production of *amaranthus* through the purchase of better agricultural inputs and as a result, increased capital obtained from the sales of the produce. Similar studies were done in Kenya that indicates growing of vegetables as a source of income (Ebert, 2014; Mwaura *et al.*, 2019; Onyango *et al.*, 2008; Simiyu & Foeken, 2014); and also in Uganda, authors Maxwell & Zziwa, 1993; Maxwell, 1995; Musiimenta, 2002 similarly observed that urban agriculture is a source of income to some households.

6.3.2 Employment potential

Basing on the findings, 54.3 percent of respondents indicated that they grow *amaranthus* for income generation; it could imply that *amaranthus* growing would be looked at as a source of employment. It shows *amaranthus* has the potential to create employment opportunities. This is advantageous to both the economy and households because overtime the poverty levels are likely to reduce. According to section 5.4.2.1 households stated that their reasons for growing *amaranthus* to obtain extra income to meet needs like school fees and capital thus meeting other households' needs.

Growing *amaranthus* is a livelihood strategy that has the potential to reduce poverty among the urban poor. This has been reported from other studies (Achigan-Dako *et al.*, 2014; Besong *et al.*, 2001; Bjarklev *et al.*, 2008; Onyango, 2010). *Amaranthus* products as indicated in table 16; leaves, seeds and processed products were mostly sold retail market and closely followed by small stalls. This is an indication that not only are crops sold at the farm gate but also the product changes hands but along that a value chain is created. Literature reports have shown that grain *amaranth* as a product takes various forms like porridge flour, used to fortify maize flour and can be used as an ingredient in processing confectionaries like cookies (Aderibigbe *et al.*, 2020; Muyonga *et al.*, 2008; Ochieng *et al.*, 2019). Once urban households can take up the opportunity of value addition

not only are more people employed but also more income is obtained from value-added products. This also shows improving the lives of the urban poor with the help of improvement of *amaranthus* products through value chain addition and locating the target market for fresh vegetable *amaranthus. Amaranthus products,* especially the grain *amaranth*, has the potential to be a sustainable livelihood strategy for Kampala farmers if they took advantage of the opportunities, especially along the value chain and potential for export.

6.3.3 Social impact potential

There are also other potential social impacts, including better use of lands, women empowerment, among others. Adoption of modern agronomic practices where some farmers resorted to backyard farming and utilising small spaces could increase sustainable and better land use. Kitchen gardens could be established where households recycle the wastes by doing this the urban environment is kept clean and fresh organic of fresh food similarly observed (see KCCA, 2018; Orsini *et al.*, 2013). Kitchen gardens are defined as gardens producing a variety of foods including vegetables, fruits and medicinal plants for home consumption or sale; they are also known for their use of recycling wastes of the urban household (Shekhar, Abebaw & Haile, 2018).

Finally, there are also other ways of empowering women through agricultural production, for example, through social groups in the form of social capital that has the potential to improve gender equality and also enhance their income. It was observed that women have access to social capital, and it has been observed that households are enabled to acquire more assets like land or livestock and irrigation.

6.4 Recommendations

Future research should also look at a broader study on different forms of capital like physical capital as a way of enhancing *amaranthu*s growing in the context of urban agriculture typologies along with other agricultural crops.

More campaigns should be taken up towards the various form of *amaranthus* besides the leafy vegetables, i.e. the grain *amaranthus* and other processed *amaranthus* products as the population is not fully aware of these forms, the most recognised *amaranthus* product is the green leafy vegetable. Farmers should be supported to add value to their *amaranthus* to fetch more returns

(income) for their products; thus, more income obtained and improving household income status. They should be provided with opportunities and knowledge on how to locally and commercially enhance their products if the full potential of this crop is to be exploited.

Extension programmes and services such as training and mentorship made by concerned institutions should consider the triple roles undertaken by women to create equal opportunities. More extension services should be brought closer to households, especially nearer female farmers so that they can access the services despite the triple roles, hence improving their productivity. Also, to avail the information post-harvest handling techniques, value addition and record keeping.

Advocation for improved agriculture practises, the overall observation showed that most households grew *amaranthus* using rudimentary technology for example using the broadcast method as means of planting. This method of production makes farmers rely on planting on direct land yet they are other methods for planting *amaranthus* like the intensive farming method. Since Kampala is an urban area that faces land competition or land is seen as a scarce resource, there should be campaigns advocating for utilising small spaces like taking more advantage of backyard or kitchen gardens, rooftop and vertical gardening.

Ordinances by KCCA should be reviewed to accommodate new entrants interested in taking on urban agriculture. The ordinances should be favourable to farmers to facilitate urban farming and provide marketing structures and opportunities for the farmers as well. There is a need to create a feedback mechanism or channel of communication between KCCA and urban farmers such that challenges being faced by these farmers have a chance at being heard.

Data collection and management should be improved by KCCA. Due to poor data collection, maintenance and management, it was difficult to fully understand the parameters of urban farming in Kampala city, there was scanty information on urban farmers in the city. I, therefore, recommend KCCA to better collect and manage their data on urban farmers to avail information tailored to the crop's capabilities when required.

In future studies, Focus Group Discussions and more key informants should be used to give more insight into the research study.

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